

## ARCHIVES OF OTOTOLOGY.

## A TRAGUS RETRACTOR.

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*(With three wood-cuts.)*

IN performing manipulations in the cartilaginous meatus, I have often experienced the want of an instrument to give a good view of the outermost part of that canal without the insertion of an aural speculum.

On drawing up the auricle in order to straighten the meatus the tragus is usually pulled backwards, at the same time covering to a greater or less extent the orifice of the canal. The tragus can of course be drawn forwards by an assistant or by pushing forward, with a finger, the skin in front of the ear, but this can be more conveniently accomplished by means of the following simple instrument.

The retractor<sup>1</sup> (Fig. 1) consists of a ring of flat metal about  $1\frac{1}{2}$  centimetres wide, made to fit firmly on the last phalanx of the surgeon's left forefinger, the ring, however, being left incomplete so that its size can be varied according



FIG. 1.

to circumstances. The end of the flat band of metal forming the ring is bent back obliquely at an angle of about 45 degrees, making a blunt hook about 12 millimetres in length. The same instrument does for both ears.

<sup>1</sup> Made by Messrs. Down Brothers, Borough, London, and Messrs. Tiemann & Co., New York.

It is conveniently made of aluminium.

The following is the method of employment :

In examining the right ear (Fig. 2) the retractor is fixed

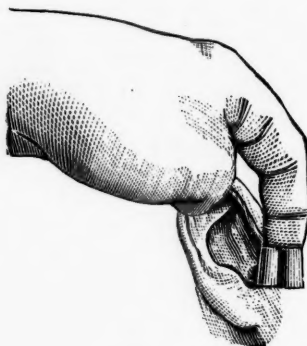


FIG. 2.

Mode of applying tragus retractor to right ear.

on to the left *index finger* in such a way that the hook points towards its dorsal surface, and whilst the auricle is drawn upwards and backwards with the left middle finger and thumb the tragus is held aside by a forward movement of the forefinger carrying the instrument.

To apply the retractor to the left ear (Fig. 3) it is fixed



FIG. 3.

Mode of applying tragus retractor to left ear

on the left *ring finger* with the hook pointing to its palmar surface, or rather towards the little finger. The auricle is then pulled upwards and backwards with the thumb and first two fingers of the same hand, whilst by pressing the ring finger downwards the tragus is easily retracted.

The instrument <sup>1</sup> thus used gives a good view of the orifice of the meatus. Needless to say that the extent to which the canal can be inspected depends not only on the size of its lumen, but also on the amount of curvature it possesses, and especially on the number of hairs present in it. A considerable extent of the membrana tympani itself is at times visible.

A few circumstances under which this retractor is useful are, the instrumental removal of cerumen, scales, etc., from the outer part of the canal, the incision of boils in the meatus, the snaring off of large polypi filling the cartilaginous meatus, etc.

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<sup>1</sup> A somewhat similar instrument attached to the left thumb may be employed for retracting the left tragus whilst the auricle is held up between the first and second fingers, but as it presents no special advantages the one just described, which does for either ear, is preferable.

## A CASE OF "SARCOMATOUS" GROWTH IN THE EXTERNAL AUDITORY CANAL.

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A young married lady consulted me on March 6, 1891, by the recommendation of Mr. Barton of Blackheath. She told me that she had suffered since childhood from left otorrhœa, and that all her life the left ear had occasionally given severe trouble from its painfulness and discharge. When about ten years old "the back of the ear was lanced," to give exit to matter. In December, 1890, being then resident in the Mauritius, she had severe pain and an "abscess burst" at the back of the ear. At this time she was under the care of Dr. Chazal of Mauritius. His full account of the case may thus be summarized: Severe pain in the ear. The incision of an abscess over the mastoid. Clearing of the canal, and evacuation of debris of discharge and epithelium, with the subsequent development of a swelling of a dubious nature, towards the posterior wall of the canal.

On examination the patient was pale and anæmic, and complained of pain and giddiness, with disagreeable cerebral sensations on the left side. A profuse watery discharge, fetid and often blood-stained, perpetually flowed from the meatus. Behind the auricle is a closed sinus. There is no tenderness over the mastoid. The throat is normal. The left nasal passage is somewhat narrowed, by a deviated septum.

On introducing a large speculum, a formidable-looking growth, of the size and shape of a large cherry, at once came into view. It completely filled the canal, and was of a pale gelatinous aspect, resembling a mucous polypus of the nose. The tumor was sessile, firm to examination by the probe, not very sensitive, and appa-



rently growing from the posterior wall of the bony canal. Complete deafness to conversation was present, and the watch and tuning-fork were heard on contact only. The canal was cleansed and purified by soaking in mercurial lotion for two days, and on March 10th the first operation was performed, Dr. F. Hewitt administering ether.

The method of removal was by snare and forceps, portions of the tumor being thus taken away, and the remainder well broken up. In consistence the growth was unusually firm, and the operation was tedious, owing to the free oozing obscuring the parts. Finally pure chromic acid was freely applied to the remains of the growth, and its ultimate destruction seemed to be complete. No severe symptoms followed the operation.

*March 13th.*—Chromic acid again freely applied under cocaine. There is less discharge, and not much pain.

*March 19th.*—Patient returned home, being instructed to syringe the ear frequently with warm and dilute carbolized lotion. Much debris of the growth has come away. The patient has, already, experienced relief from its removal.

*April 6th.*—There can be no question that the growth is returning, a nodule the size of a large pea can be seen apparently growing from the upper and posterior wall of the canal. This is more vascular and florid than its predecessor. The discharge has much diminished. There is a large perforation in the upper part of the tympanic membrane.

At this time I obtained a report of the microscopical examination of the tumor by Dr. Sheridan Délepine, pathologist to St. George's Hospital. "The surface of the tumor," he writes, "is almost entirely denuded of epithelium; the ground-substance, especially near the hilum, is composed of embryonic tissue, with spindle-shaped, round, or irregular cells, some having many nuclei, and having the character of myeloid cells. In the midst of that tissue, numerous channels, evidently vascular and lymphatic, branch in all directions. These are lined with flattened cells. . . . The tumor is a sarcoma."

I here append a drawing, made by myself, of the microscopical character of the cells. The section was stained in logwood.

The rapid recurrence of the growth after a very careful removal, and the result of the microscopical examination, made me very anxious to again attack it without delay. Seeing that it originated in the bony canal, the idea occurred to me that a more complete operation might be executed, by detaching the auricle, and chiselling away the posterior wall of the canal. Before having recourse to



a second operation, however, I requested the patient to obtain another opinion, and I met Dr. Urban Pritchard in consultation.

We agreed as to the rarity of sarcomatous polypus of the ear, but on examining the section prepared by Dr. Délepine, we could not but share his belief that the tumor was of this nature. After fully discussing all the possible methods of treatment, it was decided that I should make another attempt to remove the tumor *per vias naturales*.

The second operation was performed under ether, on April 7th. The parts being well illuminated, I attacked the growth and its bony site, with a small, sharp, and strongly curved curette, especially made for the case. I persistently scooped the bone from which the growth originated, until I had worked a small shallow cavity therein. The operation was constantly interrupted by free oozing of blood, which was checked by syringing with hot water and alcohol.

On examining the bone with a curved probe, this instrument, to my surprise, passed through a sinus inwards and backwards

towards the mastoid cells. On withdrawal of the probe pus followed its track, and it was evident that the growth had located itself round a sinus, similar in nature to the healed sinus observed behind the auricle. I next applied the fine point of a curved galvano-cautery, repeatedly searing over the cavity in the bone with perseverance and pressure, so as to destroy the surface thoroughly. Some pain, but no symptoms of dangerous import, followed the operation. Warm syringing with dilute carbolic lotion was employed.

On the third day after the operation I passed a fine curved tube into the sinus and injected several drachms of a ten-volume solution of peroxide of hydrogen into the mastoid cells. The fluid, mixed with discharge, passed freely into the naso-pharynx by way of the tympanum and Eustachian tube (?), and the sensations experienced were exceedingly disagreeable. Nevertheless I persisted, using the injection daily for a week, and afterwards once a week only. The patient used the same application to fill the meatus and "soak" the tympanum.

She was always conscious of a "seething" noise in the mastoid at the time of injection, this being doubtless due to the action of the gas upon pus.

*September 7th.*—All through the summer, the ear has been daily syringed out with a warm and dilute solution of sulpho-carbolate of zinc. The general health is greatly improved, and the discharge from the ear hardly noticeable.

*October 4th.*—The site of the operation is marked by a firm cicatrix, and the sinus seems to have closed. There is no sign of return of the growth, which seems quite eliminated. Remains of the membrana tympani are visible below, and a large perforation superiorly shows the inner wall of the cavity. The ossicles have disappeared. There is no sense of hearing, except on contact.

The improvement in the general condition of this patient was very striking, and one may well hope that, as upwards of six months have passed without return of the growth, the latter is eradicated.

There can be no doubt that true sarcomatous polypus of the ear is rare; the recurrence after removal, so often noted, being rather due to persistence of conditions which excite growth of embryonic granulation tissue, than any inherent malignant constitution of that growth itself. In the

present instance the microscopical characters of the tumor are certainly those of a myeloid growth. Its peculiar gelatinous aspect, and rapid recurrence after removal, are in favor of this view. The evident association of this growth with a suppurating sinus, is a clinical point which may be urged against this opinion. Malignant disease of bone, with the exception of epithelioma of the jaws, is very rarely associated with suppuration. On the discovery of a sinus, I felt encouraged in giving a more favorable prognosis than had hitherto been justifiable. I am strongly in favor of giving to the microscope a subordinate position in respect to accurately observed clinical facts. Rapidly growing embryonic tissue, such as the "fungoid" granulations about necrosed bone, presents cellular types and configurations so like sarcoma as to render a differentiation by the microscope very problematical. I need hardly say, that this is a very important consideration for those who would operate upon microscopical evidence alone.

The treatment of this growth, in the second instance, was suggested to my mind by the recollection of similar proceedings in cases of sarcoma of the orbit, antrum, and tibia. I have several times seen undoubted sarcomatous tumors removed from these localities by scooping them out and applying Pacquelin's cautery. The results have been, in several instances, immunity from recurrence for many years. The operation performed in the present case was a miniature but faithful representation of this proceeding. The result is very satisfactory, and promises to be a definite cure. Should this anticipation be falsified, sufficient relief and immunity, have been experienced, to point to the efficacy of the operation.

## A HANDY FORM OF INTRA-TYMPANIC SYRINGE.

By URBAN PRITCHARD.

(*With one wood-cut.*)

IT is very often asserted that when there is a perforation in the membrana flaccida the accompanying otorrhœa is practically incurable. And it must be confessed that grounds exist for this unfavorable prognosis. In the first place, the perforation itself is usually a very small one, and consequently very liable to become blocked with inspissated pus, etc. Secondly, the situation of the membrana flaccida, at the extreme upper part of the *Mt*, is such as to render the process of cleansing one of great difficulty and delicacy, and, for the same reason, the introduction of appropriate instillations is by no means easy. Finally, the communications which exist between the attic and the mastoid antrum, and, usually in the adult, with the mastoid cells, while rendering thorough and systematic cleansing even more desirable in these cases, yet further increase the difficulties.

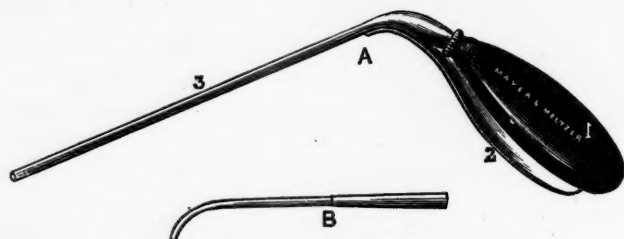
To overcome these obstacles it is now usual to employ a special form of syringe (intra-tympanic). Of these several patterns have been suggested. Thus, for instance, Dr. Hartmann uses a small ball syringe with a long, fine, metal tube bent at the tip; Dr. Delstanche has adapted his well-known little force pump to a fine metal tube; and other shapes have been proposed.

The syringe which I am now using myself (see Fig.) may be looked upon as a modification of Dr. Hartmann's, but it has what I venture to think are the following advantages, viz.:

1. The rubber reservoir (1), instead of being in a direct line with the metal tube (3), is fixed at an obtuse angle, and at the same time is made oval in shape; the instrument does not therefore interfere with the due illumination of the meatus.

2. Beneath the reservoir, and of the same size, a spoon-shaped metal plate (2) is attached to the metal tube; this serves as a *point d'appui* in applying pressure with the thumb to the reservoir, which can thus be easily manipulated with one hand.

3. The fine metal tube is straight, but if, as is so frequently the case, we wish to direct the stream of fluid at an angle, a small second tube (B) is provided, curved at the tip, and fixing on to the straight tube by a simple plug-joint. This second tube is very useful, but is not in itself a novelty.



Intra-tympanic syringe.

A, 1. Rubber bag. 2. Spoon-shaped metallic support. 3. Straight tube. B. Tube with curved nozzle, fitting on to 3.

The method of using this little instrument is sufficiently obvious; the whole is carefully filled with the warm fluid about to be injected, and, the air being expelled, the straight or bent tip, as may be desired, is inserted into the perforation, the meatus and membrane being well illuminated. By slight pressure of the thumb the reservoir is emptied, the stream being directed into the attic according to the position of the tip—straight forward or to one side.

In the same way the syringe may be used for the subsequent introduction of any instillations that may be deemed advisable, but for whatever purpose it is used, thorough cleansing and sterilizing after each sitting is very necessary; for this purpose I myself employ alcohol, which has the additional advantage of being non-corrosive.



Of course such an instrument as that which I have just described can only be used by the surgeon; for every-day use by the patient or his attendant I am in the habit of ordering a syringe with a fine metal nozzle, to the end of which, and projecting for about three fourths of an inch, is fixed a piece of very narrow rubber tubing. This tubing, being soft and pliable, may, without risk, be introduced into the meatus right up to the perforation, and, in using it, the nozzle of the syringe should be directed upwards and a little forwards.

I have been very gratified with the results which the two methods of treatment above described have yielded in my hands, but, at the same time, I cannot help thinking that there is yet much to learn with regard to the treatment of these troublesome cases, and that we ought to be able to look forward to a much larger percentage of recoveries than is at present obtained.

A CASE OF DEAF-MUTISM, WITH AUDITORY  
ATROPHY AND ANOMALIES OF DEVELOP-  
MENT IN THE MEMBRANOUS LABYRINTH  
OF BOTH EARS.<sup>1</sup>

BY DR. ARNO SCHEIBE, OF MUNICH.

Translated by Dr. J. A. SPALDING, Portland, Me.

(With Plate I. of vol. xxii. German edition.)

I OWE to Prof. Bezold the two temporal bones here to be described and the notes on their macroscopic condition.

F. M., æt. 47 ; autopsy, March, 1883.

Clinical diagnosis : phthisis ; deaf-mutism.

General result of autopsy : Vocal cords normal ; laryngeal cartilages calcified ; at the posterior commissure an ulcer  $1\frac{1}{2}$  cm long, partly extending into the arytenoid cartilage. Extensive fibrinous pleuritic adhesions. Left lung : Superior lobe has a large cavity ; lower lobe, numerous peri-bronchitic nodules. Right lung : Cheesy deposits, with gray and yellow peri-bronchitic nodules.

Dura mater adherent, and, on the anterior and middle cranial fossæ, thickly strewn with minute dark-brown dots. Arachnoid at the summit of the calvarium milky.

The innermost convolution at the base of both temporal lobes shows cystoid degeneration as large as a quarter of a dollar ; cysts developed at the expense of the brain, filled with a clear liquid, and the walls distinctly pigmented. The third left temporal convolution shows similar cystic degeneration, with walls distinctly pigmented. None of the cysts or any brain substance has been adherent to the dura.

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<sup>1</sup> From the histological laboratory of the Pathological Institute in Munich.



The convex side of the right temporal lobe is sunken over a surface the size of a silver dollar, with serum beneath. There is nothing abnormal in the fossa Sylvii, although the overlying membranes are opaque.

The stria acustica consists of four fine fibres on the left side, and of but two on the right.

Microscopic examination of the auditory nerves in a fresh state fails to show any atrophy in the teased out preparations. All of the fibres have a medulla. No corpora amylacea present.

#### MACROSCOPIC EXAMINATION OF BOTH TEMPORAL BONES.

Naso-pharynx and both memb. tym. normal.

Some labyrinthine fluid escapes on opening the superior semi-circular canal. Manometric examination shows normal mobility of the ossicles.

On removing the right tegment we see numerous delicate transparent cords and membranes running from the long process of the anvil in various directions, and especially a thick band-like double tendon, attaching the shank of the anvil to the *Mt.* The spot of attachment outside does not reveal any sinking inward of the *Mt.* The stapes is also circularly attached with many delicate fibres, but it yields abundantly to the slightest touch. Vascular congestion on promontory and in tube.

Left tympanum has but a single fibre running from long process of anvil to the *Mt.*, and a few fibres from the stapes to its niche. The round window in both ears is bridged over with a few radiating cords.

The labyrinths which had lain in 70 per cent. alcohol for seven years were now placed into 96 per cent. alcohol, then for twelve days decalcified in a 5 per cent. solution of saltpetre, then imbedded in celloidin and cut into sections perpendicularly to the longitudinal axis of the pyramid. The specimens were then finally compared with a number of similar preparations from normal ears hardened and decalcified by various methods.

The tissues thus prepared were found to be better preserved than after a brief hardening in strong alcohol. The cross-sections of the nerves were particularly beautiful, owing to the distinct coloration of the axis-cylinders. Grenacher's hæmatoxylin proved the best staining material.

## HISTOLOGICAL CONDITION.

The cords and membranes in the *middle ear* did not impair the function of hearing. They were occasionally attached to the membrane of the round window, drawing it in a funnel shape toward the tympanum. The secondary drum-head and the stapido-vestibular symphysis were normal.

The *tensor-tympani muscle* is only half as thick as usual, and its bony canal is undeveloped, the measurements being about the same as in infants. Nevertheless the various muscular fibres are of normal diameter. Most of them are finely granulated, and show coarsely granular destruction and shrivelling of the muscular substance. The fatty tissue is somewhat largely developed at the beginning of the tendon.

*Inner Ear.*—The auditory and facial nerves have been torn from the right internal meatus. The process of dura mater is normal at the entrance into the internal meatus, but deeper in; the walls of some of the vessels are thickened, hyaline, and unstained. Additionally, the endothelia of the lymph spaces are excessively proliferated, so that the latter on cross-sections resemble glands. The interior of the periostrum contains corpora amylacea, varying in size and form. Yellowish-brown pigment also abounds. The left internal meatus contains a small piece of the normal facial nerve. The alterations, otherwise, are about the same as on the other side. The facial nerve in its course through the petrous bone is normal on both sides.

The *right cochlear nerve* is excessively atrophic in the tractus foraminulentus and further along in the lamina spiralis ossea, where the nerve fibres are scarce. They are most abundant in the first convolution (Fig. 3, *n*<sup>2</sup>), whilst there is no trace of them in the third convolution, although the appertaining bundle in the central canal is present though atrophic. The lost elements have not been replaced by connective tissue, but the affected spots are empty. The few remaining fibres exhibit irregular contours and slight granulations, alterations which may be explained by the action of the alcohol.

Rosenthal's canal in all the convolutions exhibits uniform and quantitative atrophy of the *ganglion spirale*. But the remaining cells are normal. In contradistinction from treatment with Mueller's solution the protoplasm, by shrivelling, has retracted from the endothelial membrane, exhibits granulation, and absorbs some of the staining material. Another remarkable alteration in this region is the appearance of lacunæ (filled with serum?) with smooth borders (Fig. 3, 1), though a few contain tissue fibres projecting into the interior. The enveloping membrane contains connective-tissue fibres, nerves, and ganglionic cells. The lacuna always lies next to the exit of the nerves into the lamina spiralis ossea, where normally there are but few if any fibres, so that it is due more to destruction of nerves than of ganglionic cells. Consequently we see the locality of the lacunæ in the first convolution occupied by thin nerve bundles.

The nerve and ganglion cells are much more abundant in the first convolution on the left side, together with some variations in the ductus cochlearis, which affect Reissner's membrane, Corti's membrane, and the stria vascularis.

*Reissner's membrane* seems to be absent on both sides, in the vestibular portion of the cochlea and the adjacent portion of the first convolution, unless represented by a membrane which lies close to the lamina in its whole extent, does not run over the ligamentum spirale,<sup>1</sup> but toward the modiolus. At the beginning of the basal convolution we can follow this membrane along the cochlear wall to the ligamentum spirale, and shortly after it raises itself from its base, and leaves free, in the angle between the lamina ossea and the wall of the cochlea turned toward the modiolus, a space, which in the right cochlea rapidly increases in size upward, leaving Reissner's membrane almost perpendicular to its normal direction, and closing the beginning of the scala vestibuli in a blind sac about the first convolution. Again in the rest of the first and in the second and third convolutions, the insertion of Reissner's membrane is abnor-

<sup>1</sup> By this I mean in the rest of this paper the entire semilunar stratum (Gottstein).

mal, the line of insertion at the lamina ossea running mostly along the normal position, whilst the other end is not attached to the stria vascularis, but at the upper periphery of the ligamentum spirale or farther inward at the periosteum of the bony wall. From here to the line from which it ought to spring the periosteum of the external cochlear wall and the adjacent lamina spirale, as far as the normal insertion of the membrane, is covered with a thicker layer of cells than usual (Fig. 3, between r and e). This is probably the continuation of Reissner's membrane, which has attached itself to the underlying surface.

Most of this membrane in the *left* cochlea presents itself lying fast attached to the lamina ossea and cochlear wall, and only lifted away in the angle between the two. The reclining or rather the adherent portion, as well as the free portion, contains much pigment, partly free, partly in large ramified cells. In some of the sections the membrane lies so close to the periosteum, that the ductus cochlearis occupies the whole half of the cochlea at the expense of the scala vestibuli. Reissner's membrane is also abnormally attached on the left side. In both, the membrane is excessively bulged forward toward the scala vestibuli (Fig. 4, r).

*Corti's membrane* is rudimentary here and there, and exhibits important pathological relations to the cells of the internal spiral sulcus. The latter are either in one layer as usual, and then higher than ordinary, or, what is oftener seen, they cover the sulcus in a double or triple layer with pigment. The cells which line the laminae membranaceae between the sulcus and Corti's organ are occasionally higher, or else they form a double layer. We also see a thin, deeply stained, and occasionally pigmented membranaceous layer of cells near the attachment of Reissner's membrane, beginning at the usual insertion of Corti's membrane. This layer extends over the end of the limbus and then sinks into a curve, where it unites with the outermost cells of the sulcus, and more frequently with the cells lying behind this and Corti's organ (Fig. 1, b).

Now in this shut-up space and filling it completely is

rolled up the rudiment of Corti's membrane without any insertion. In a few sections, it presses between the upper limbus lamina spiralis and the overlying cell membrane, where, however, it is not inserted upon the crista, but separated from it by a single layer of cells.

There is still another abnormality in the shape of a bridge, running directly to the stria vascularis (Fig. 2, br), and consisting of two plates of flat cells lying close to one another, yet leaving between them a narrow space partly filled with pigment granules. One of these plates is inserted into the upper surface of the crista spiralis, to which it is attached from its free margin to the usual insertion of Corti's membrane, while the other plate varies in its insertion. It may spring from all parts of the sulcus internus as well as from the membrana basilaris in its whole extent, as far as Corti's organ, and from all the cells of the same. Wherever seen, in the sections, it is this bridge which contains between its plates the rudiments of Corti's membrane, and we can follow its continuation into the curved above-mentioned cellular layer in which we found Corti's membrane imbedded. The situation of this membrane between the plates varies with the locality of the single plate. If this were inserted at Corti's organ or near by, then the rudiment would lie there. But if the plate arises from the first cells, so that both plates are inserted near one another, then Corti's membrane is found enclosed by the latter at some distance from the labium vestibulare of the crista spiralis (Fig. 2, m).

Corti's membrane is only normally located at the beginning of the first, and for a short space in the second convolution, provided that the cells of the sulcus internus are normal, but even in that case it is smaller, and has cells on its surface and occasionally in its interior. It was absent at some spots, but whether torn away artificially or not, we could not decide.

The anomalies of the *stria vascularis* were alike on both sides: totally absent at the foot of the first convolution, its place being occupied with a layer of epithelium greedily absorbing the staining material.



Another anomaly is a ridge-like elevation resting with a broad base on the stria (Fig. 4, 1), running close above the foramen spirale and keeping about the same distance all along its course. It is higher than the prominentia. The rest of the stria is covered with a pavement epithelium. The structure, papilla-like in transverse sections, consists of cells, pigment, vessels, and a few fissures between. The rest of the stria is normal, even in thickness, where the ridge is the thickest. This portion of the stria also contains fissures, so that there is but little left of the tissue of the stria itself. The contents of some of these fissures is stained.

The two plates of the bridge continue along the stria, the lower plate forming a prolongation of the ridge, whilst the upper one proceeds farther upward, so that we see between them a triangular space with a broad base (Fig. 2) and partitioned off at intervals into minute spaces by delicate fibres and cellular tissue.

The prominentia spiralis is normal.

*Corti's organ is present in both cochleæ*, but lower than normal, the pillars scarcely hinted at or entirely invisible. The cells are preserved in their normal connections, except in the middle of the first convolution on the right side, where the nerves are more atrophied than elsewhere. The cell envelopes are indistinct, the protoplasm stained but little despite alcoholic hardening. The hyaline globules in Corti's organ are pathological, extending to Claudius' epithelium. On the left side they have absorbed some staining material. The surface of Claudius' epithelium exhibits well stained globules quite different from corpora amylacea. The cells of the external sulcus are normal.

The *vestibule and semicircular canals* show less alterations than the cochlea.

Part of the nerve fibres of the nerve of the sacculus is lost, and between the rest lie corpora amylacea. The *posterior ampullar nerve* is atrophic, with large lacunæ between the bundles, and in its canal are amyloid bodies. The *external ampullar nerve* has lost few fibres; the *utricle and superior ampullar nerves* are normal.

The membranaceous portion of the *sacculus* cannot be

well studied in these sections. We can almost assert that the otolithic membrane is surrounded by a membrane of a single layer of cells, which on the surface turned to the lumen of the sac are flat, on the side toward the auditory epithelium cubical. Here the membrane is united in the middle with the macula by means of a thin pedicle, so that it looks like a mushroom. The cubical epithelium extends on both sides of the pedicle, and passes over into the tall epithelium of the hearing spot. The pedicle too is filled with minute hearing stones, which extend into the chief large mass of the otoliths with a few drop-like structures lying about.

The cubical epithelium, which forms the transition between the hearing and the pavement epithelium, contains interstices and round granules about half the height of the epithelium, which show by their reaction to the stain that they are different from the structures described in the cochlea, and the amylaceous bodies by staining violet instead of blue. As they imbibe Babes' saffron stain<sup>1</sup> they may consist of colloid.

The neuro-epithelium of the *utricle* with its hearing-hairs is well preserved. The interior of the epithelium contains a few colloid bodies. The hearing-spot is surrounded by a spongy membrane without otoliths. The outer wall of the utricle exhibits many changes, the upper layer of connective tissue being transformed into regular spaces filled with hyaline, whilst between are clusters of corpuscles resembling otoliths, but smaller and more uniformly arranged. Additionally there are cellular cylinders with walls of cubical epithelium, and containing material stained like colloid. One of these cylinders opens into the utricle.

The epithelium of the crista of the *posterior semicircular canal*, in correspondence with the well marked atrophy of the nerve, exhibits numerous colloid bodies. We see the same at the crista, though they are absent in the neuro-epithelium of the inferior canal.

The aqueducts of the vestibule and cochlea are normal.

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<sup>1</sup>Virchow's Archiv, Bd. cv., iii.

The labyrinth has a large amount of pigment even in the normal portions.

*Résumé.*—The *middle ear* is normal with exception of the hyperplasia and partial degeneration of the tensor tympani.

The *labyrinth* shows atrophy of the nerves of the cochlea, sacculus, and posterior ampulla, as well as alterations in the membranous structure of the cochlea and sacculus. The latter are simply anomalies of formation.

The inclusion of Corti's membrane in the cells of the sulcus internus was the remains of an embryonal stage. According to Koelliker the sulcus at a certain stage in embryonal life is filled with a very tall epithelium, upon the surface of which and of the crista Corti's membrane is formed as a cuticular exfoliation. In our case, the rudiment of the membranea tectoria is totally surrounded with cells so that its relation to the crista varies at spots. Whilst there we get the impression that Corti's membrane originated as a cuticular secretion; here it seems to develop between the cells themselves. Directly connected with this alteration in the internal sulcus lies the bridge which is stretched from the sulcus to the stria vascularis.

We also see how the ridge on the stria proceeds directly from this bridge. The formation of this abnormality, as well as the abnormal height of the stria vascularis elsewhere, reminds us that in embryonal life the part in question is pushed forward into the ductus cochlearis.

The abnormal insertion of Reissner's membrane may be either a disturbance of development, or something depending on the enlargement of the stria vascularis, which is considered as a secretory organ of the endolymph. We might imagine that permanent hypersecretion of the latter had pressed Reissner's membrane against the wall till it had gradually attached itself to it. But this is a supposition to be taken with much reserve.

The cell-holding otolithic membrane of the sacculus may also be recorded as an abnormality of development.

The deaf-mutism must be regarded as chiefly due to the *atrophy of the nerves*. But we cannot decide whether this is



to be referred to possible cerebral alterations since an examination of the long since misplaced brain was not made. The only thing of which we can be sure is that in the labyrinth there is no trace of any former inflammation, which in all the previously reported cases of deaf-mutism with auditory atrophy could be determined.<sup>1</sup>

We ought to emphasize, in our case, that the atrophy was confined to the nerves of the cochlea, sacculus, and posterior ampulla—in other words, to those three branches which before their entrance into the petrous bone compose the posterior ramus (Retzius), whilst the nerves of the utriculus and of the other two ampullæ which compose the other trunk of the auditory nerve (anterior branch) are not distinctly atrophic.

Mygind's<sup>2</sup> compilation of deaf-mutes, to which three new ones are to be added, Schultze,<sup>3</sup> Haberman,<sup>4</sup> Largen and Mygind,<sup>5</sup> and one overlooked by Mygind, Moos and Steinbrügge,<sup>6</sup> contains no case exactly like ours. It is possible that some of the older sections in which the *macroscopic* investigation resulted negatively might have yielded similar alterations to a more accurate investigation.

*Explanation of the Figures.*

Fig. 1. *co*—Corti's organ.

*z*—Increased cells in the sulcus spiralis.

*b*—Arched layer of cells extending to the limbus laminæ spiralis osseæ.

*m*—Corti's membrane.

Fig. 2. *s*—Semilunar stratum.

*c*—Crista spiralis.

*b*—Basilar membrane.

*co*—Corti's organ, badly preserved.

*p*—Prominentia spiralis.

*br*—Bridge.

*l*—Lacuna in the stria vascularis.

<sup>1</sup> With exception of a single case reported by Politzer in his handbook.

<sup>2</sup> *Archiv. f. Ohrenhklde*, Bd. xxx.

<sup>3</sup> *Virchow's Archiv.*, Bd. cxix.

<sup>4</sup> *Zeitschrift f. Heilkunde*, Bd. x.

<sup>5</sup> *Archiv. f. Otologie*, Bd. xxx.

<sup>6</sup> These ARCHIVES, xii., 247.

*ls*—Ridge with attachment to lower plate of the bridge.

*m*—Rudimentary Corti's membrane.

Fig. 3. *r*—Rosenthal's canal.

*la*—Lamina spiralis ossea.

*g*—Ganglion cells.

*l*—Lacuna.

*n*<sup>1</sup>—Entering nerve fibres.

*n*<sup>2</sup>—Departing nerve fibres.

*b*—Connective tissue.

Fig. 4. *s*—Stratum semilunare.

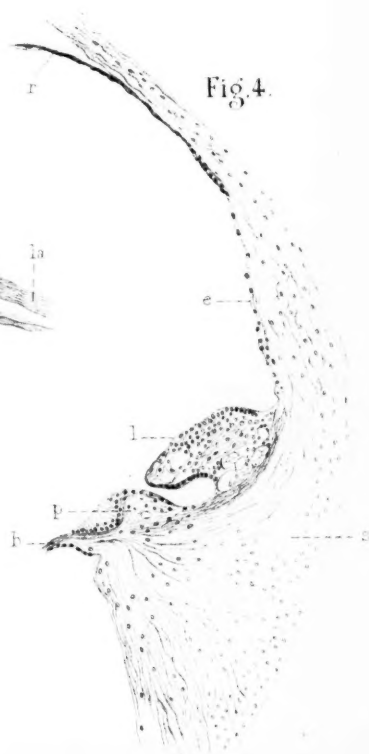
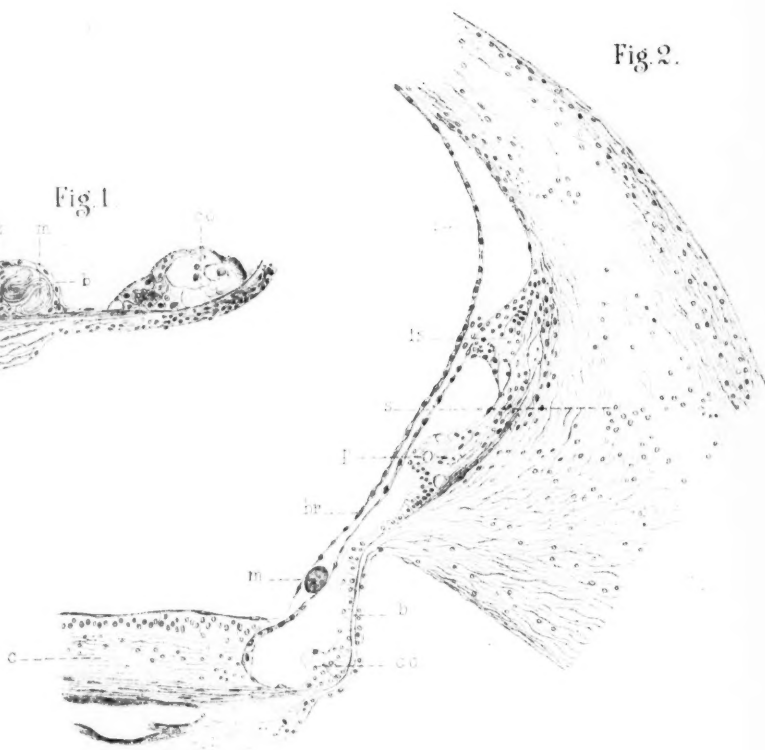
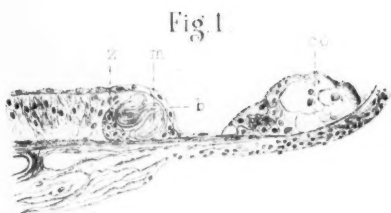
*b*—Beginning of basilar membrane.

*p*—Prominentia spiralis.

*l*—Ridge on the stria vascularis.

*e*—Flat cells on the rest of the stria.

*r*—A piece of Reissner's membrane bulged forward toward the scala vestibuli, inserted somewhat peripherally, and extending farther on in a thicker layer of cells.





## FURTHER EXAMINATIONS OF THE LABY- RINTHS OF SIX PETROUS BONES FROM CHIL- DREN WHO HAD DIED OF DIPHTHERIA.

BY PROF. S. MOOS, HEIDELBERG.

Translated by Dr. MAX TOEPLITZ, New York.

(With Plate II. of vol. xxii., \*German edition.)

THE following communications serve to fill up to some extent the deficiencies left in my former paper on bacterial invasion of the labyrinth following diphtheria. The material used for this purpose consists of the same six specimens which have been used for the examination of the corresponding changes of the middle ear (these ARCHIVES, vol. xx., p. 52).

### THE HISTOLOGICAL ALTERATIONS IN THE LABYRINTH

could, in these six cases also, be based upon the immigration of the same micro-organisms, as in the affections of the middle ear, viz., micrococci and streptococci. In two cases, in a case of primary pharyngeal diphtheria of six days' standing (cp. Case 2 of the affections of the middle ear), and in a case of scarlatinal diphtheria of five days' duration (cp. Case 4, l. c.), the groups of micrococci were partially arranged in grape form, so as to suggest a mixed infection of staphylo- and strepto-cocci.

In addition I emphasize the following facts taken from my notes: Groups of cocci upon the external wall of the sacculus (Case 4), together with molecular products of disintegration, and also in the perilymphatic trabecular

reticulum of the utricle (4); furthermore micrococci and streptococci upon the ligaments of the membranous semi-circular canals (Cases 1, 2, and 6) in the layer of connective tissue of the crista of the sagittal ampulla (Cases 4 and 6), in the vessels of the Haversian canals imbedded in leucocytes and upon their vascular external wall (Case 1), along the endosteum of the first cochlear turn (about this later on), and between the layers of the lamina spiralis ossea, etc.

#### THE ALTERATIONS IN THE VASCULAR SYSTEM.

##### THE VASCULAR THROMBOSES

occur, as it is thus far generally agreed, in consequence of mycotic fatty degeneration of the endothelia; in incomplete thrombosis (developed perchance shortly before death) or when a portion of the thrombosis is already disintegrated, as, *e. g.*, in thromboses composed of leucocytes in the modiolus, the endothelia in fatty degeneration stained black with osmic acid may be found. They occur in the vessels of larger and smaller calibre. Thromboarteritis and thrombo-phlebitis of the larger vessels of the inner auditory meatus and of the Fallopian canal are not unfrequently found. In the thrombus itself the micro-organisms, partly free, partly imbedded in blood-cells, can be demonstrated. The hyaline degeneration of the external vascular wall in the facial canal probably depends upon immigration of micro-organisms from the tympanic cavity, which is favored by existing defects of ossification. The development of the vascular changes is here explained in the same manner as in those produced in animals after subcutaneous injection of staphylococcus pyogenes.

In addition to mycotic, fatty degeneration of the endothelia in diphtheria the poisonous products of metabolism, the *toxalbumin* (Brieger and C. Frankel) of the bacillus of diphtheria, probably play an important part. The globular stasis, the extremely great extent of vascular thrombosis over the entire petrous bone, especially in septic diphtheria, the frequent occurrence of hemorrhages, the changes of the red corpuscles, their great variety of form, principally their

shrunk appearance (cp. Fig. 13 in the diphtheritic affections of the middle ear), point to an injurious effect of the diphtheritic poison upon the walls as well as upon the contents of the vessels. There is scarcely a place in the petrous bone where such hemorrhages, probably due to toxic necrosis of the vascular wall, cannot be demonstrated, as, *e. g.*, in the periosteum of the carotic canal (diffusely), in the jugular fossa, the petrosal fossula, in the tracts of the acoustic nerve and its branches, along the endosteum of the first two cochlear turns, along the periosteum of the lamina spiralis ossea of the first and second turn, especially upon the tympanal surface, in the region of the vascular stria, in the facial canal, upon the ganglia, in the hiatus subarcuatus, in the osseous marrow at the different places of the cochlear duct, along the tympanal surface of the basilar membrane up to the spiral ligament, occasionally joining the hemorrhage at this place, furthermore in Corti's organ, in the cochlear aqueduct, etc. O. Silbermann's experiments<sup>1</sup> and de Ruyter's investigations<sup>2</sup> throw light on these conditions.

According to Silbermann, intravital thromboses occur also in poisoning produced by substances that dissolve blood corpuscles, viz., chloride of sodium, glycerin, pyrogallie acid, also arsenic and phosphorus, just as in the experiments of the Dorpat school after injections of leucocytes and of the stromas of the red corpuscles. Silbermann has even furnished the heretofore unknown proof of the constant occurrence of capillary thrombosis by means of intravenous injections of pigments into severely diseased animals (complicated with hemorrhages, and especially with hemoglobinuria). The parenchymatous organs were stained like marble, motley places changed off with unstained ones, etc.

De Ruyter tried by means of spectral analysis to trace the changes of the blood color in different infectious diseases. In some forms of severe sepsis, *e. g.*, inoculation

<sup>1</sup> "The Coagulative Action of Certain Blood Poisons," *Med. Centralbl.*, 1888, No. 16; and also, "Intravital Blood Coagulations, Produced by Certain Doses of Toxic Drugs and Other Substances," *Deutsche med. Wochenschr.*, 1888, No. 25.

<sup>2</sup> "The Relation of the Blood Color in Infectious Diseases," XVII. Congress of the Deutsche Gesellschaft f. Chirurgie, second meeting, April, 1888, *Deutsche med. Wochenschr.*, 1888, No. 19.



of the virus of malignant œdema, after putrefaction of the blood a band could be observed in the spectrum, which bears certain relations to that of methæmoglobin. As in diseases produced experimentally, De Ruyter, *in a series of cases of severe human diphtheria* with marked septic symptoms, could also produce the changes of the blood color after the reduction of the blood, a result which was never arrived at with other blood. Further investigations should tend to prove whether the changes of methæmoglobin are dependent upon the action of ptomaines.

*New-Formation of Blood-Vessels.*

Their full description, illustrated by a drawing, will presently appear in *Virchow's Archives*. It was observed in Case 4 in the perilymphatic space of a semicircular canal; there existed a formation of vascular ramifications, arising from the adventitious cells of pre-existing vessels, probably in consequence of irritative phenomena caused by slow emigration of micro-organisms from the vessels, subsequent increase of microbes, coagulation of lymph, nuclear division and nuclear increase of the lymphoid elements, etc., probably mixed infection of staphylo- and strepto-cocci.

THE ALTERATIONS OF THE PERIOSTEUM IN THE DIFFERENT PARTS OF THE LABYRINTH.

The relation of the labyrinthine periosteum in infectious diseases excites our especial interest, for its vessels play a great, probably the greatest, part in the immigrations of the micro-organisms, and they participate in the changes of the periosteum, as well as in those of the adjoining tissues, the bone, the ligaments of the vestibular apparatus, the nerves, etc. The study of these changes in fresh cases is instructive for the better understanding of the genesis of the condition in such individuals, who die long after their recovery from the infectious disease.

In my first paper on bacterial invasion of the labyrinth in simple diphtheria I explained, with reference to the negative results of examination, the changes of the periosteum and of the adjacent bone from the "globular stasis" and



the "vascular thrombosis" respectively. I can no longer sustain this view, believing rather these changes to be due to *direct action* of the micro-organisms, the mode being identical with diphtheria of the cochlear capsula, as I have described it in the affections of the middle ear (cp. *l. c.* Figs. 3 and 13). The periosteum is corroded and destroyed by the micro-organisms, and the osseous necrosis becomes more extensive by their further emigration.

Just as in the above-mentioned paper the propagation of the osseous necrosis from the labyrinthine wall to the spiral ligament has been described and illustrated (*l. c.* Fig. 13), the entire process may take place in inverse direction, either from the internal auditory canal around the internal cochlear cavity toward the labyrinthine wall, or from the inner surface of the osseous semicircular canal in the same direction. If thrombosis of the periosteal vessels is associated with the bacterial action, the effects are enhanced and the bony destruction is the more extensive. The most extensive destructions of the bone were found in Case 2. There existed *numerous*, partly *communicating* necroses, developing from several places of the labyrinthine wall, which extended to the osseous limits of the vestibular apparatus and also to the spiral ligament, and around those arising from the internal auditory canal, laterally penetrated the cochlear capsule; the modiolus also was corroded in its entire transverse section.

The following results of examination are worthy of especial notice:

*a.* The condition of the periosteum of the osseous semicircular canals and of the ampullæ: These are by far the most frequent. I have described and illustrated them before (cp. Fig. 2, in simple diphtheria); the periosteum may be loosened to a great extent or entirely missing.

*b.* The condition of the endosteum of the first cochlear turn in Cases 1 and 2: Enormous quantities of cocci were here found along the endosteum; where the microbes were scantier, they exhibited distinct chain formations, osseous necrosis being at places therewith associated.

*c.* The condition of the layer of the lamina spiralis ossea:

Numerous streptococci were found between its layers (Case 2).

d. The condition of the periosteal layer of the spiral ligament (Cases 4, 5, and 6).

In consequence of the transmigration of microbes from the vessels of the periosteum of the spiral ligament (the innermost of its three layers), there develop alterations which are partially exhibited in individuals who die of other diseases long after the termination of the infectious disease. Three different degrees of destruction may be observed in these cases:

1. Disintegration of the greater part of the spiral ligament; later atrophy, or formation of lacunæ.

2. Development of a sequestrum of the adjoining cochlear capsule close to the periosteum. This sequestrum is crescentic and mostly parallel with the periosteal layer of the ligament.

3. The osseous necrosis progresses toward the labyrinthine wall which it reaches. This is favored in the cochlear capsule by the great abundance of cartilaginous islets which rapidly disintegrate. Laterally from the sequestrum numerous metaplasts are seen with cartilaginous cells in fatty degeneration, also necrosis of the cartilaginous capsules, which are followed (Case 6) to a great extent toward the inner tympanic wall by necrosis of the bone with sinuously corroded edges and streptococci in the sinuses.

e. The condition of the periosteum of the *vestibular aqueduct*: In the former description of the paths of invasion, I thought it possible for the microbe to enter the vestibular aqueduct from the dura mater along the fibro-periosteal connective tissue which lines the osseous vestibular aqueduct and "contains a number of minute interstices [Rüdinger], possibly corresponding with minute lymphatics" [Schwalbe]. The emigration of the micro-organisms from the blood-vessels of this fibro-periosteal connective tissue, which in fact takes place (Cases 1, 4, 5, and 6), presents a *new* and *direct* path of invasion of the endolymphatic space. As consecutive conditions destruction of the epithelium or small and giant nuclear cells and molecular products of disinte-

gration are found ; in Case 1 (septic diphtheria with enormous quantities of micrococci and streptococci, free and imbedded in cells) even necrosis of the osseous walls of the aqueduct was found.

#### OTHER ALTERATIONS OF THE PERIOSTEUM.

These consist in hyaline and colloid degeneration. The former is found principally in the region of the internal auditory and in the facial canal, the latter in the lining of the carotic canal and the jugular fossa, almost invariably associated with diffuse hemorrhages. In the facial canal I found the external vascular wall in hyaline degeneration so intimately connected with the periosteum in hyaline degeneration (Case 2) as not to enable me to recognize their boundaries. The periosteum may at isolated places present lacunæ in consequence of disintegration (facial canal, Case 2 ; carotic canal, Case 6).

Simultaneously with this decay *central* necrosis may develop in consequence of bacterial invasion into the bone corpuscles ; extent and severeness of this alteration depend upon the intensity of the infection. I shall mention as an example the result of examination of the transverse destruction of the modiolus.

#### THE ALTERATIONS OF THE BONE MARROW.

The micro- and strepto-cocci penetrate into the interior of the fat and medullary cells and produce colloid degeneration of the contents of the medullary space, or necrosis. Fragments of necrotic bone of the medullary space are found at places, imbedded in remnants of disintegrated marrow and large collections of margarine (septic diphtheria), and diffuse hemorrhages (Cases 1, 2, and 6), together with products of disintegration and colloid masses, associated with necrosis of the bone adjoining the medullary cavity, confluence of the medullary spaces, and streptococci arranged in series in the corroded osseous sinuses. Here and there the medullary spaces are entirely empty. The colloid degeneration may exceptionally comprise the entire marrow of the pyramid. This condition is extremely marked in osmium specimens, in which black-stained fat cells cannot be traced.

The vessels of the Haversian canals are either normal or thrombosed, or they contain streptococci imbedded in leucocytes, which are found also upon their outer vascular wall.

#### THE ALTERATIONS IN THE REGION OF THE LABYRINTHINE LIGAMENTS.

While, in former observations upon alterations in an opposite direction, I could trace the conditions consecutive to *irritation*—new-formation—as well as to *necrobiosis*, I missed in these six cases the condition of new-formation.<sup>1</sup> I found, however, but exceptionally direct nuclear division, without cellular infiltration or hyperæmia of the ligaments, and everywhere the appearances of *coagulation necrosis*, similar to the condition in measles; endothelia without nuclei, their disintegration, formation of granular cells, molecular products of disintegration, complete destruction of the ligaments, and consequently unusually frequent *collapse of the membranous semicircular canals* (cp. illustration), unless the endolymphatic space was filled with the molecular products of disintegration of its epithelial layer, and with apparently older collections of lymphoid cells. I believe, nevertheless, that in the former, and in these cases we have not to deal with microbes of different pathogenic character, but with *quantitative* differences only. The microbes were markedly more numerous in these six cases.

#### ACCUMULATIONS OF LYMPHOID CELLS IN THE PERI- AND ENDO- LYMPHATIC SPACES OF THE VESTIBULAR APPARATUS, AND THEIR METAMORPHOSES.

These mechanical consecutive conditions of the immigrated micro-organism were found four times among six cases. The specimens of Case 4 present beginning ossification in spite of the brief duration (five days) of the disease.

<sup>1</sup> The perilymphatic space of *one* semicircular canal excepted (scarlatinal diphtheria of five days' duration), with new-formation of vascular ramifications (cp. above). In the two other membranous semicircular canals there existed coagulation necrosis; one of them exhibited the collapse characteristic of this condition.

This is remarkable, for it proves, first, the marked tendency of petrous bones of children to pathological ossification, a fact which many years ago was first pointed out by Voltolini; secondly, that in diphtheria, the invasion of the microbes into the blood circulation (in accidental, not in specific, affections) may take place extremely early, even without necrosis of the pharyngeal mucous membrane, probably in the first hours. This view is supported by the fact that microbes like the *oïdium albicans* (Merkel) or the tubercle bacillus (Merkel, Cornet) may penetrate through the normal epithelia of the mucous membranes. In diphtheria it is, according to Kolisko and Paltauf, quite probable that the virus of the specific diphtheritic bacillus prepares the intact epithelium for the invasion of accidental micro-organisms.

THE ALTERATIONS OF THE ACOUSTIC NERVE AND ITS BRANCHES.

We distinguish two large groups of alterations. The first group contains the *hemorrhages*, which I have observed four times among these six cases. With reference to the details I refer to my former publication. The second group contains two cases of mycotic nervous degeneration. A case (3) of primary pharyngeal and tonsillar diphtheria of one week's standing; another (Case 6) of relapse of scarlatina.

The destructions in the main trunk are enormous; it may be destroyed in its entire transverse section. The consequences for the peripheric nerve branches and the ganglionic cells consist in *interruption of conduction*, *atrophy*, or *complete destruction*. The axis-cylinder resists longest; in the last stage before its entire disintegration it is marked only by granules arranged like rosaries. In the *peripheric branches* of the acoustic, of course, the *mycotic degeneration* may appear *independently*. In Case 5 I could find it in the terminal apparatus of the crista of the horizontal ampulla.

*Direct mycotic degeneration* of the ganglionic cells also is possible. I have not observed the degeneration itself, in Case 6, however, I noticed the penetration of micrococci into the nuclei of Schwann's sheath and into the cellular substance of the ganglionic cells.



THE ALTERATIONS IN THE REGION OF THE COCHLEAR  
DUCT

are the consequences partly of more or less *considerable hemorrhage*, partly of a more or less extensive *coagulation necrosis*. Both conditions may be combined.

The main source of the hemorrhages is situated in the region of the *spiral* ligament, of the endosteum of the first two cochlear turns (in the third turn no endosteal hemorrhage was found), and also in the periosteum of the osseous lamina of the first and second turn.

The coagulation necrosis is the consequence of the immigration of microbes in great number.

## ABSENCE OF REACTIVE INFLAMMATION.

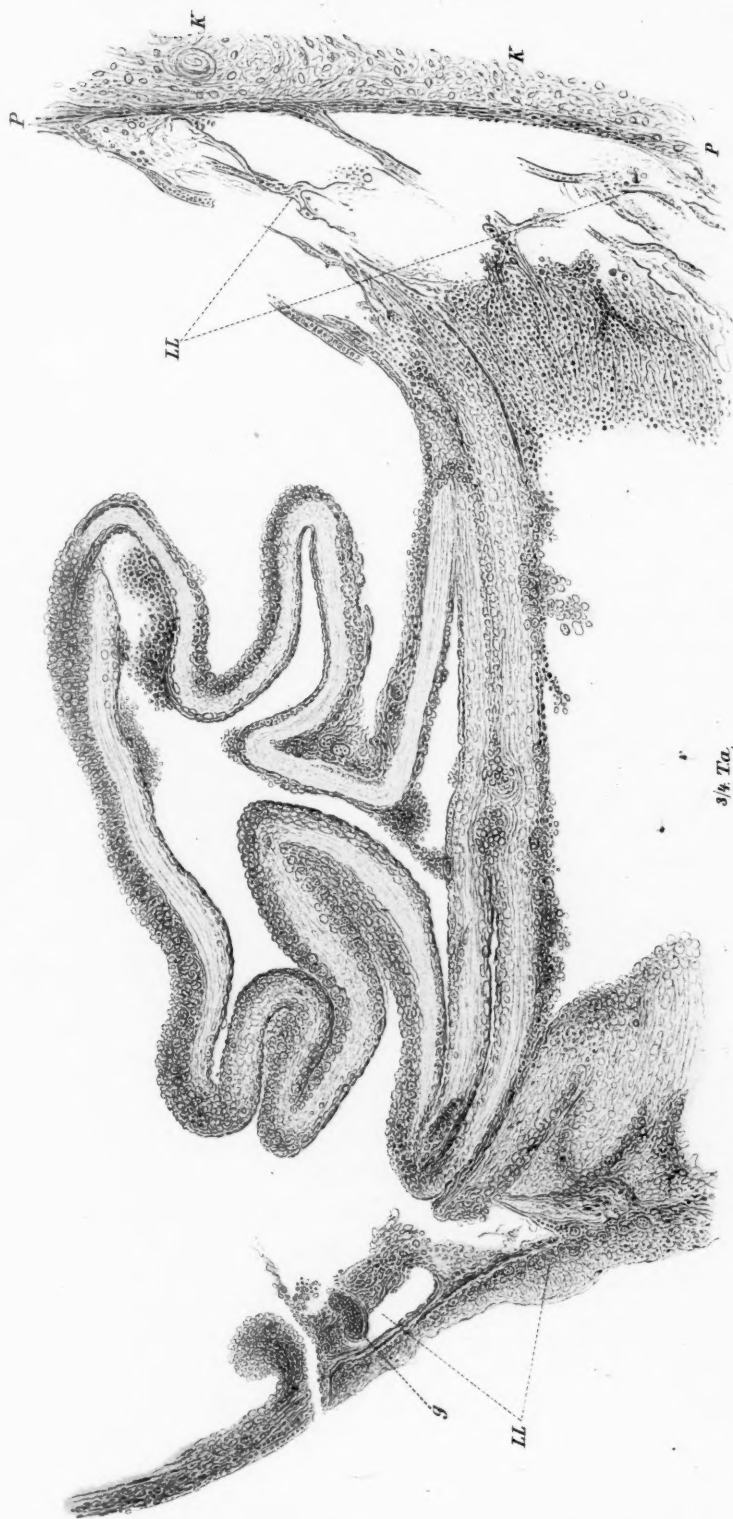
In the description of the alterations in the middle ears of these six cases I have emphasized the absence of a tendency to suppuration. No trace of such a tendency was discovered in any labyrinth. Appearances of new-formation could nowhere be found, apart from new-formation of vessels upon a limited territory in the membranous labyrinth of Case 4, while this took place to a great extent in the former cases. Nevertheless, I do not believe that in the two series of investigations we have to deal with the action of pathogenically or biologically different microbes, but I am rather inclined to believe in a quantitative difference of the transmitted infectious germ or of its primary virulence, or of both combined (case of septic diphtheria).

We may succeed in the course of time, based upon Hans Buchner's<sup>1</sup> excellent investigations, in explaining the *absence of all inflammatory reaction*.

It results, among other facts from Buchner's experiments that the inflammation is one of the most potent protective means against bacterial growth, and that the production of an intense inflammatory reaction initiates the cure of a bacterial process. We could, therefore, be tempted to suppose that, in my cases, the absence of inflammation has

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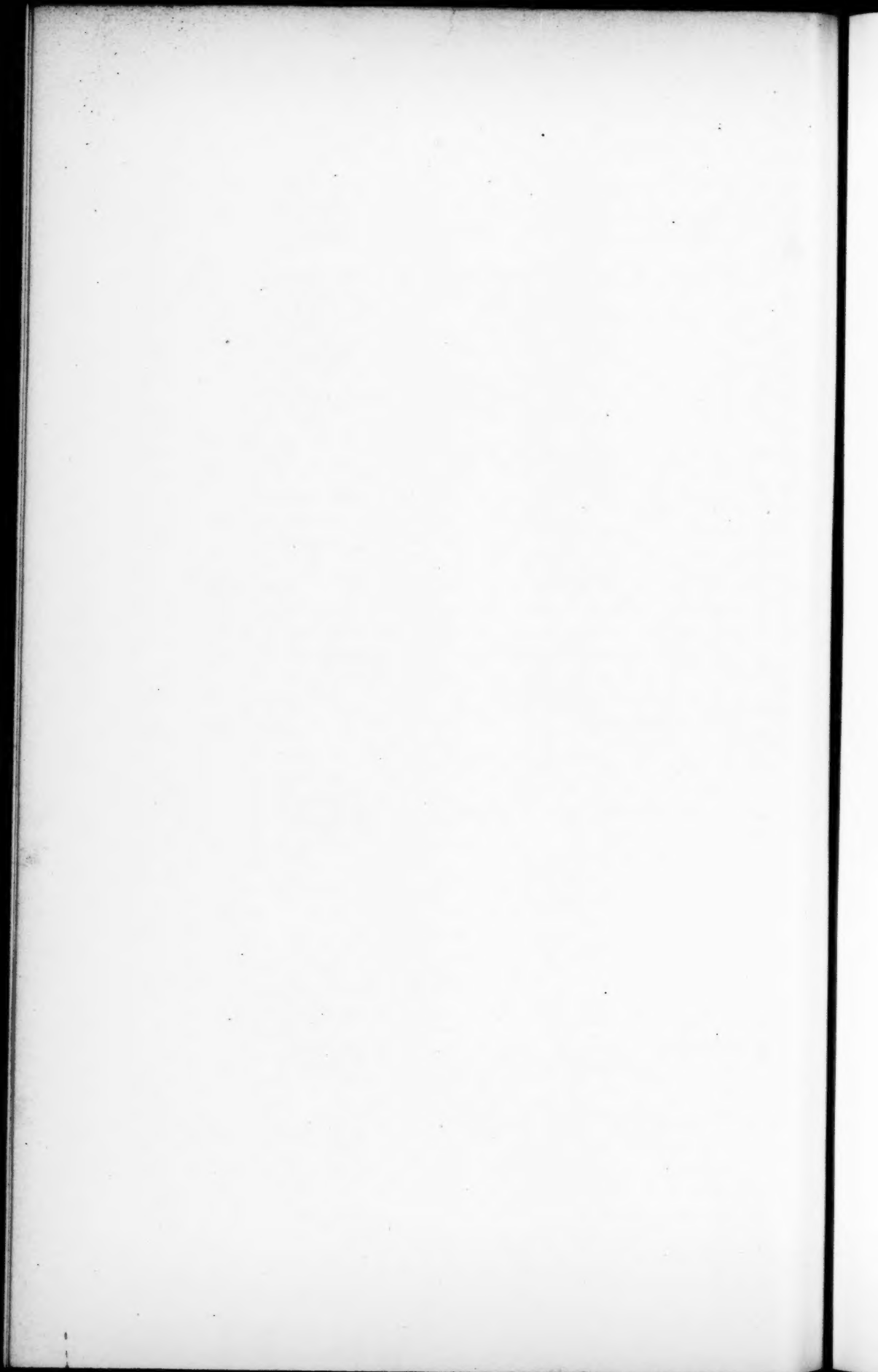
<sup>1</sup> "The Proteines of Bacteria and Their Relation to Inflammation and Suppuration."—*Centralbl. fur Chirurgie*, 1890, No. 50.



F. Veith. ger.

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ZEITSCHRIFT FÜR OHRENHEILKUNDE. XXII.

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· favored the increase of immigrated bacteria, and in this terrible affection has thus indirectly contributed to the enormous destructions in the hearing organ.

*Explanation of the Illustration. Plate II.*

A portion of a sagittal section from the membranous horizontal semicircular canal, medial crus. Child two years old. Scarlatinal diphtheria. Five days' standing. Diphtheritic inflammation, with formation of pseudo-membranes in naso-pharynx and larynx. Necrosis of mucous membrane. *Hartnack*  $\frac{3}{4}$ .

The labyrinthine ligaments are partially destroyed, together with their endothelial lining; the membranous canal, therefore, collapsed. *K* bone, *P* periosteum, *L L* labyrinthine ligaments, *G* blood-vessel. Also, where the ligaments are still preserved, the cellular elements are wellnigh completely destroyed. In place of the nuclei of the layer of the connective tissue, molecular products of disintegration are seen. The same holds good for the epithelial layer of the membranous semicircular canal. Distinct structure of nuclei and epithelia of the membranous semicircular canal are only exceptionally observed with large magnifying power.

Clusters of products of disintegration are seen in the endolymphatic and also in the perilymphatic space. These cover partially the propria, which has thereby partially lost its sharp outlines.

A CASE OF INJURY TO THE EAR BY A STROKE  
OF LIGHTNING, WITH PERFORATION OF  
THE MEMBRANA TYMPANI.

BY DR. E. S. CLARK, OF SAN FRANCISCO, CAL.

George Walker, æt. thirty-four, residence Helena, Montana, consulted me September 25, 1891, presenting the following history : Last May, while riding in a buggy with his wife and child, he was struck by lightning on the left side of the head, it passing down the ear, along the neck and breast to the right arm, where it burned through the flesh, leaving the bone exposed, then passed out into the metal-work of the buggy. The horse was killed, as was also a cow standing near. The patient's wife and child, however, escaped uninjured. The external ear and the meatus, as far as could be seen by the attending physician, were burned superficially. The physician stated that the drum was injured. There appeared a discharge from the meatus, which was apparently cured in about ten days, by keeping the ear cleansed as well as circumstances would allow. He has been troubled with deafness and tinnitus ever since.

*Stat. Præs.* : Hearing,  $h = \frac{1}{100}$ . Auricle normal. Some desiccated purulent matter mixed with cerumen adhering to walls of meatus was removed ; the meatus then appeared normal. Memb. tymp. very much congested and thickened : about 1 mm from and below the inferior extremity of the manubrium a mass of dry, hard matter about the size of a pin-head was seen, which on removal proved to be hardened pus, with a small quantity of soft matter adhering to the inner portion. The memb. tymp. then presented a round perforation about 1.5 mm in diameter, the edges being somewhat thicker and more congested than the surrounding parts, with some serum oozing from the perforation. With catheter a clear perforation sound was heard ; middle ear dry ; no râles.

Carefully cleansed with cotton moistened with a one-per-cent. solution of carbolic acid, and, after drying, applied boracic powder.

*Sept. 26th.*—Meatus perfectly dry ;  $h = \frac{4}{100}$  ; catheter forces out a trace of serum through perforation. Same treatment.

*Sept. 29th.*—Have used catheter daily ; the perforation has been gradually decreasing in size ; a small quantity of hardened serum was removed from its edges.

*Sept. 30th.*—Memb. tymp. only slightly congested ; perforation so small as to be scarcely visible,  $h = \frac{6}{100}$ .

*Oct. 1st.*—Perforation closed entirely ; with catheter tube well open, no perforation sound ; memb. tymp. pale almost to normal ;  $h = \frac{10}{100}$ . Patient desiring to return home, I permitted him to leave.

*Oct. 27th.*—I received a letter from him stating that the hearing had steadily improved, though his "ear seems to ring some yet."

In this case the drumhead may have been ruptured by :

1. The direct stroke of lightning.
2. By the actual cauterization of the entire surface of the external meatus and drumhead followed by suppuration, this afterwards penetrating into the middle ear.

I am inclined to the former belief, on account of the history given, as well as the condition of the ear when I first saw the patient.

REPORT OF CASES OF DISEASE OF THE MAS-  
TOID PROCESS. WITH REMARKS.

BY THE LATE DR. HY. FERRER AND DR. E. S. CLARK,  
OF SAN FRANCISCO, CAL.

(ARTICLE IV.<sup>1</sup>)

(With two wood-cuts.)

CASE 34, CONTINUED.—Removal of Posterior Osseous  
Wall of the External Meatus; Cure in Four Weeks.

From December, 1888, to February, 1889, the boy has been going to the German Hospital at irregular intervals to have his ear syringed by one of the nurses. I was absent during that time, but on my return I had the opportunity, February 12, 1890, to examine him again.

*Status Præsens*: No discharge on cotton taken from the external meatus, but on removal of the same a very fetid odor was noticed. On the mastoid a cicatrix parallel to posterior insertion of auricle depressed in its centre with a small fistulous opening in which a probe can be introduced two or three milli-

<sup>1</sup> Continued from page 182, vol. xviii., of these ARCHIVES.

Article i., vol. xvii., p. 308; article ii., vol. xviii., p. 25; article iii., vol. xviii., p. 139.

The MS. was accompanied by the following letter:

Aug. 17, '91.

Dr. H. KNAPP,  
New York.

DEAR SIR: Enclosed I send you the remainder of Dr. Ferrer's mastoid cases (Nos. 34-60 inclusive). The first lot—34 to 44—Dr. Ferrer himself had completed before his death. The remaining sixteen I have written up partly from the Doctor's notes and partly from memory, having assisted him in the operations of the last thirty-five cases, and treated most of them for a greater or less length of time.

Whatever has been written by myself I have placed in parentheses and signed my own name. I am, etc.,  
E. S. CLARK, M.D.

metres. The external meatus narrowed by collapse of its walls, therefore no details of fundus are visible.

I was satisfied from the above condition that there was still caries in the depth, and I therefore decided to operate after Küster in order to put an end to the long and tedious treatment.

*Operation.*—Ether narcosis. The usual antiseptic precautions taken, the auricle was detached from its insertion by a semicircular section. With an elevator I then detached the entire cutaneous wall of the external meatus from its osseous portion as far as it reaches. The auricle, as well as the cutaneous portion of the external meatus, was then drawn forward with a strong retractor, thus laying bare the entire posterior osseous wall. The periosteum also was drawn backward, exposing a defect in the external plate of the mastoid. This is the opening made by the first operation; it was found covered with granulations and cicatricial tissue. I then proceeded to chisel off the posterior osseous wall of the meatus, removing it in layers from upward downwards and from downward upwards. When at a depth of nearly two centimetres I scooped the cavity of the mastoid, which was filled with granulations, very fetid pus, and cheesy substance. The remainder of the osseous wall of the meatus was then removed, partly with chisel and mallet, partly with a special pair of bone forceps I had constructed for this purpose. The loss of substance thus produced was large enough to enable me to feel its deepest portions with my little finger and to remove with my forceps whatever particles of bone projected. This work was continued until I was convinced that the entire posterior wall was removed as far in as the cavum tympani and aditus ad antrum. I then divided the cutaneous portion of the meatus by a section running from its insertion into the cartilage to its innermost end. This was done in order to prevent retention of pus between the cutaneous meatus and the cavity in the mastoid, and in order to facilitate the adaptation of the skin to the walls of the cavity. The operation was an exceedingly neat one, with hardly any hemorrhage until the cutaneous wall of the meatus was divided.

To avoid tedious repetitions which are unnecessary in the precise report of mastoid operations, I will only briefly mention the general course pursued in the after-treatment. There was no reaction whatever, the boy remaining in bed two days suffering from the after-effects of ether. There was no more discharge

than would be expected from such a surgical operation, and it had no fetid odor. The meatus and the mastoid were irrigated daily with carbolized water and filled with iodoform gauze. The cavity in the meatus began to granulate, the gauze was then dispensed with, the auricle becoming firmly attached to its posterior insertion, leaving a linear cicatrix. The external meatus began to widen, extending backwards into the mastoid. The external orifice of the meatus was thus its narrowed portion as it gradually widened in its deeper portions. Still the fundus did not exceed much over one centimetre in diameter, all the walls as well as the fundus (external osseous wall of the labyrinth) being lined with epidermis. March 26th he was discharged and advised to call twice a week. To-day, March 31st, the cotton pellet, left in since the 26th, is perfectly dry, and on mopping with cotton at the end of a cotton holder very little moisture is obtained.

Professor Küster, of Berlin, in his article ("Ueber die Grundsätze der Behandlung von Eiterungen in starrwandigen Höhlen," etc., etc., *Deut. med. Wochenschrift*, 1889, No. 10, u. ff.), condemns Schwartz's method of operating and after-treatment, and recommends two ways of operating. He subdivides the cases of affection of the mastoid into two classes, the one in which the disease is entirely restricted to the mastoid, the middle ear being free, and the second, in which both middle ear as well as the mastoid are implicated. For the cases in which the mastoid alone is affected he advises a way of operating which, in its description, differs from Schwartz's method only in the use of a chisel instead of a gouge. This can be seen in the large number of cases recorded by Schwartz and his pupils, also by myself in these ARCHIVES. Schwartz's method in general is to remove all of the bone that is diseased, even going beyond the limit of the antrum, as I have seen myself. In the second category of cases, in which the affection is in the middle ear as well as in the mastoid, Küster advises the entire removal of the posterior osseous wall as far as the membrana tympani, or even beyond this. In the first case he applies one drainage tube, passing it into and out of the external meatus; in the second case he introduces two drainage tubes, one in the meatus, and one in the mastoid. This operation differs entirely from



Schwartz's or anything ever done before, and I do think that it will shorten the treatment of chronic cases, provided that all affected portions of the bone have been reached by this method. We must not forget that the anterior osseous wall of the cavum tympani as well as the air-cells above the same are often the seat of the affection, and are not reached,



FIG. I.

or imperfectly so, by Küster's method of operating. To remove pieces of the attic Hartmann has constructed a special instrument, which he demonstrated at the last meeting of naturalists in Heidelberg, September, 1889, and which, according to the pieces removed by the same, may do good service.

In May, 1889, I had the honor of being the guest of Professor Zaufal in Prague, and saw him operate two cases

after Küster. Here I first conceived the idea of using a bone forceps for working in the depth, especially used by Zaufal to remove the anterior portion or the ring of the aditus ad antrum. The branches of the forceps were too short and too weak, and I was present when the operator broke one of the branches in trying to remove that portion of the bone.

The forceps I use (Fig. 1) and which I had constructed by Wulffing (Luer's successor) in Paris, has very long branches and is much stronger than the one of Zaufal, though sufficiently delicate to allow snipping off a piece of bone of 5 mm, if necessary, by an orifice in the mastoid of 15 mm and a depth of over 4 cm, if required. The length of the cutting branches is 43 mm, and their cutting end as represented in Fig. 2 in natural size.



FIG. 2.

**CASE 35.—Profuse Fetid Chronic Otorrhœa of Right Side; Operation Followed by Facial Paralysis; Temporary Relief.**

Joseph R., æt. fifteen years, came first for advice December 6, 1887, accompanied by his mother. The boy had had a purulent discharge from the right ear for the last three years or even longer, and no attention had been paid to it until lately, when for the first time he began to complain of pain in as well as behind the ear.

*Status Præsens*: Externally, nothing abnormal. The mastoid region somewhat sensitive to pressure, but not swollen. The meatus filled with very fetid dark discharge. After syringing, the membrana tympani was noticed almost entirely destroyed, some granulations filling up the middle ear, and no trace of the

ossicles. With the catheter the Eustachian tube was found perfectly free. No denuded bone could be felt with the probe.

The treatment consisted in daily syringing the external meatus with a 2½ % solution of carbolic acid, and syringing through the catheter with a weak solution of sodium chloride. Some of the granulations were removed partly with the snare, partly cauterized with nitrate of silver or chromic acid. This treatment was continued until the 13th of February without any material improvement. The granulations would form almost as rapidly as destroyed, and the discharge remained very copious and fetid. Classifying the case under the fifth indication for operation by Schwartze, I sent patient to the German Hospital, and operated on the 13th of February.

*Operation:* Ether narcosis, incision 4 to 5 cm long through the normal soft integuments. The periosteum well adherent was pushed aside. The external surface of the bone was perfectly normal. Near the posterior wall of the meatus the emissary openings were manifold; but neither the linea temporalis nor the spina supra meatum was well defined. After taking the necessary orientation I began to chisel, making an opening about 0.01 high and 0.006 wide. The bone was exceedingly compact, the external plate 3 mm thick. I penetrated into the bone 2 cm without finding any air-cells. At this depth the finest chisels (Schwartze's 3 and 4) were used to a depth of 2¼ cm. Here the bone substance had gradually become somewhat softer and of dark color, and by means of sharp scoops I penetrated to a depth of 2½ cm. During the entire operation careful observations as to the topographical relations and depth were repeatedly taken. Patient was then allowed to come to, in order to try forced injections, but no communication was obtained. Antiseptic dressing was applied.

*February 14th.*—Patient in bed, at once I noticed that he had partial paralysis of the right side of the face. Temperature last night 37.2° C., this morning 37.4°. The bandage being saturated with blood, it was removed, the wound and meatus syringed with carbolized water, and fresh bandage applied.

*February 15th.*—No fever. He groaned considerably during the night, complaining of pain in the ear. The mother, resident physician, and myself remarked that the facial paralysis was much less. When the bandage was removed a very fetid odor was noticed, but the discharge from the meatus had perceptibly decreased.

*February 17th.*—Same condition. On the 18th he was allowed to promenade in the sun, and on the 19th he left the hospital, to be treated from now on as an out-door patient.

*February 22d.*—He has been treated daily in same manner. The wound is granulating nicely. The facial paralysis has remained unchanged. The discharge from the meatus is as fetid as ever. I syringed with a solution of sublimate, 1:3000, per tubam with the catheter, which produced a considerable smarting sensation in the throat for a couple of hours. In carefully probing the cavum tympani I failed to detect any necrosed bone. No communication has been obtained by forced injections.

*February 29th.*—Patient has been treated daily. His external meatus was syringed with sublimate and tartaric acid (Kretschmann's mixture) and sodium chloride per tubam with the catheter. The wound in mastoid is closing rapidly, and therefore a lead nail  $1\frac{3}{8}$  cm long was inserted and held in by a spring.

*March 3d.*—No special change in condition of the ear, the wound fitting tightly around the nail. The fistula now is 2 cm deep. The facial paralysis has increased. Dissatisfied with the condition of things, I decided to scrape the fistula again, which I did without narcosis, penetrating as far as  $2\frac{1}{2}$  cm, and enlarged the fistula in the bone. Even now no communication was obtained, and a nail  $2\frac{1}{2}$  cm long was inserted.

*March 4th, 5th, and 6th.*—Had some earache during the night.

*March 21st.*—Has been attended daily. To-day the nail was shortened. The discharge from the meatus has not decreased, but is less fetid.

*April 1st.*—The general health of the boy has improved very much. I removed the nail and in a very few days the fistula closed entirely.

*April 16th.*—The discharge from the meatus and the fetid odor have ceased entirely. To-day the catheterization was followed by some hemorrhage. As the air passed with difficulty, I supposed that a foreign body, a sequestrum, had been displaced by the pressure of the air, but probing carefully I failed to detect any.

*May 21st.*—The discharge is now minimal, and patient will be treated every other day. The facial paralysis, which is complete, has been treated with electricity without any beneficial effect.

*August 8th.*—While having the electricity applied, patient com-

plaints that he does not feel it, and also complains of loss of sensibility over the entire body. He was examined first by pinching with a pin, and it was found that the sensibility was very much reduced, especially in the lower extremities. He feels dizzy and light-headed all the time, and almost drops from the chair when the catheter is applied. At times there is some greenish discharge of peculiar odor from the meatus. During the month of October he was treated with creolin instead of carbolic acid or sublimate, without any material benefit.

During the first half of 1889 he has been treated once a week, then at an average once a month, remaining about in the same condition, with little but still very fetid discharge. The facial paralysis has remained the same. He is attended at home by syringing with lukewarm water and instillations of sublimate alcohol 1:1000.

As mentioned above the indication for operating in this case was the fifth of Schwartz ( "*Die Chirurgischen Krankheiten des Ohres,*" page 333). The eburneation of the mastoid process was probably the result of the chronic otorrhœa and is of frequent occurrence. There is no doubt that the caries was situated more deeply, and that even to-day the patient is in great danger. As two efforts were made to reach the antrum or to obtain communication with the carious parts, and both times were a failure, the question occurs to me whether Schwartz's method was the one to adopt in this case, or whether after finding the above-described condition of the bone it would have been better to follow Küster's advice, to chisel away the entire posterior wall of the external meatus, and thus with less danger and more certainty reach the antrum. Küster's advice is undoubtedly a good one for chronic cases, and surely the one I will follow in this one if another operation is required. When after beginning to operate, according to Schwartz, a certain depth has been reached without entering the antrum, the safest way is to follow Küster's advice (*l. c.*) to chisel off the posterior wall of the external meatus, and to end the operation according to Dr. Karl Wolf "as if the external meatus was enlarged backwards."

A very unfortunate accident in this case was the facial

paralysis, setting in a few hours after the operation, and which was surely of a traumatic origin. Traumatic lesions of the facial nerve are of frequent occurrence during mastoid operations, and are easily explained when we bear in mind that, as a rule, we have to penetrate to a depth of from 20 to 25 *mm* to reach the antrum, and that, according to the recent researches of Dr. Hartmann ("Personal Notes Taken at the Sixty-Second Meeting of Naturalists and Physicians in Heidelberg, October, 1889,") who has investigated a large number of bones, the facial nerve is often reached at a depth of 17 *mm*, and that it averages 22 *mm*, measured as well from the spina supra meatum as from a point 1 *cm* behind the spina, which area is the one ordinarily selected for operating.

The partial loss of sensibility over the entire body, as well as the prolonged dizziness, shows that the process has advanced far enough inward to produce central nervous disorders, which I will not endeavor to explain. This loss of sensibility, as well as the dizziness, has been of intercurrent character, and at present the patient is entirely free from it.

Very unusual was the hemorrhage which followed an insufflation of air through the catheter. I use for this purpose Lucae's double bulb as modified by Bezold, and to which I have altered the valves in order to obtain a continuous stream. The pressure of the reservoir bulb when pumping, with the lower one is sufficient in most cases, and only when strong resistance is met with by compression of the filled reservoir with the right hand pressing it against my side, I am able to surmount obstructions and open the tube in the most obstinate cases. In this one the tube was always so free that in syringing through the catheter (after Schwartze) the fluid ran from the meatus in a stream. On this special occasion, after the resistance was overcome by strong pressure on the reservoir bulb, the air passed freely accompanied at the second insufflation by a free outflow of blood. When the catheter was removed it was not stained with blood, showing that the hemorrhage did not originate in the orifices of the tube or in the tube itself. My first



impression was that a small sharp sequestrum had been displaced by the force of the air that it produced the hemorrhage. After carefully syringing until the hemorrhage had stopped and the middle ear was carefully dried I made a thorough investigation by probing, but failed to detect any rough bone or sequestrum.

**CASE 36.—Acute Purulent Inflammation of the Left Middle Ear; Operation; Empyema of Mastoid with Extensive Destruction of Bone; No Communication; Cure in Four Months.**

H. P. L.—, forty-five years old, had been under treatment with his family physician for the last six weeks with profuse discharge from the left ear accompanied by pain. January 26th, he having complained of pain behind the ear, his physician fearing some mastoid complication advised him to apply to me.

*Status Præsens* : Left auricle normal, the mastoid region œdematous and sensitive to pressure. In the external meatus some fluid pus. After syringing and drying, the lumen of the meatus was found normal except in its innermost portion where it was constricted and injected, thus preventing a full inspection of the membrana tympani. A pulsating drop of pus could be seen at posterior and lower segment. With the catheter under strong atmospheric pressure, air penetrated the tuba but no perforation sound could be heard; the same result by inflating with Politzer's method. A pellet of absorbent cotton was introduced as far as the memb. tympani to act as a drain. The mastoid and part of the occipital regions were shaved and a strong ointment of iodine in lanolin thoroughly rubbed on the same. A Priessnitz bandage was then applied. Patient has no fever, his complexion is yellow, but he sleeps well, and has a good appetite.

*January 27th and 28th.*—Same condition, the discharge being very free. The mastoid region being still œdematous and sensitive to pressure I advised patient to submit to an operation the following day.

*January 29th.*—Patient had a good night's rest; the discharge from the meatus, the swelling and sensitiveness of mastoid region, much decreased. He consequently requested me to postpone the operation.

*February 3d.*—He has been feeling better every day, the

discharge has been decreasing under the same daily treatment. The pain having ceased the moist bandage was exchanged for a dry one.

*February 4th.*—He complains of stiffness of the neck, the mastoid region more swollen, the swelling extending down the neck, and is also more sensitive to pressure. There is no discharge, and the meatus is more constricted. Inflations have been tried daily as well with the catheter as by Politzer's method without obtaining perforating sound. Frequent instillations of a warm boracic solution, repeated every two hours, were ordered and during the intervals Priessnitz moist bandage.

*February 5th.*—He had pain in the ear and over the left eye. Swelling and sensitiveness of mastoid the same. There is to-day some discharge in the meatus. Continued with same treatment, and urged patient to submit to an operation.

*February 6th.*—Patient had a good night's rest, the swelling of mastoid region less, and more discharge from the meatus. In blowing his nose he feels the air penetrate into the ear, but neither with catheter nor by Politzer's method am I able to obtain perforation sound.

*February 17th.*—His condition has remained about the same, with intermittent good and bad nights. There has been but very little discharge, and also intermissions in the swelling of both the meatus and mastoid region. Though no marked elevation of temperature has been noted, his general health is now bad, the tongue is coated, he has no appetite, and is mentally very much depressed. He decided to go to the hospital and be operated on.

*February 18th.*—The usual preparations of shaving and disinfecting were first carried out. Ether narcosis. Incision close to posterior insertion of auricle into the bone, the soft parts being at least half an inch thick. This was followed by considerable bleeding, parenchymatous as well as from distended blood-vessels, necessitating four ligatures. Compression with a sponge was used until the bleeding had subsided. The periosteum, which was well adherent to the bone, was pushed aside. The external surface of the bone of normal color. The mastoid had an abnormal shape, besides being very large. The spina supra meatum was fairly defined, but the prolongation of the linea temporalis (tuber mastoidei) formed an irregular tuberosity with its lower edge projecting over the surface of the mastoid proper.

On the surface of the latter, almost covered by the edge of the tuberosity, were a number of openings for the emissary veins. I began to chisel away the projecting edge of the tuberosity, and then chiselled out an oblong piece of the external plate. At 2 to 2½ mm depth I came to a small cell filled with cheesy substance, and which had no visible communication with any other cavities, at the depth of 3 or 3½ mm fetid pus began to ooze out. Exploring with a probe I found that the entire mastoid was transformed into a large cavity. After enlarging sufficiently the opening made with the chisel, I used Luer's bone forceps and removed the entire external plate as far as the sutura mastoideo-occipitalis and downwards to the apex of the appendix. The external plate was hard, apparently normal, averaging 3 mm in thickness. The defect thus produced measured 0.035 in vertical, and 0.025 in horizontal, direction. Directly under the external plate was an accumulation of decomposed fluid pus; the contents of the mastoid consisted partly of a cheesy and of a soft granular substance, and but few remnants of trabeculæ. All this was carefully scraped out, and the cavity thus obtained was astonishingly large, its external walls had been thoroughly removed in order to avoid any retention of pus. During the operation carbolized water was used. No communication was obtained. Temperature in the evening, 37.9° C.

*February 19th.*—He had some opiate during the night on account of restlessness. This morning temperature 37.4°. The dressing being saturated, but dry, was partly removed; the layers of iodoform gauze which were in the cavity of the bone were not disturbed. No discharge from the meatus. Fresh bandage applied.

*February 23d.*—He has been dressed daily. Patient has had no fever, and he feels perfectly well, and was able to sit up to-day. There is considerable purulent discharge from the mastoid, but none from the meatus. Sublimate was used in dressing instead of carbolized water. The posterior surface of the cavity begins to granulate, and the swelling of the soft parts is somewhat diminished.

*February 24th.*—The bandage became loose during the night, and was applied by the resident physician who held the auricle displaced, producing pain and discomfort all night. The consequence was that the parts around the auricle were found very oedematous. After he was dressed carefully, the pain ceased.

*February 26th.*—Yesterday and to-day he is in perfect condition, and walked in the garden. The cavity in the bone is granulating nicely on all sides.

*March 1st.*—The granulations in the cavity are dark-red and sluggish; after cleansing they were cauterized with a 5-per-cent. solution of nitrate of silver.

*March 2d.*—Cauterization had good effect and was renewed. Patient leaves the hospital to be treated from now on as an out-door patient.

*March 3d.*—Called at office. Memb. tympani thickened, of dull-red color; no perforation visible; h., 0.025.

*March 21st.*—He has been attended daily; the granulations, very soft, have been frequently cauterized or superficially scraped with a sharp scoop. The cavity is still 0.015 deep; h., 0.075. He now attends to his business.

*April 12th.*—The granulations from the soft parts have gradually extended into and are filling the cavity. To-day the cicatrization from the edges has proceeded so far that it was found necessary to apply a conical lead nail of 0.02 long and 0.01 wide at base, which was naturally held by a spring, and the usual roller bandage dressing dispensed with.

*April 13th.*—The nail has produced considerable œdema of the parts and discomfort. The reason for this was that it had to be introduced with considerable pressure. After cleansing, it was inserted again.

*April 15th.*—The opening in mastoid is very much larger than if produced by sloughing of the granulations, measuring from  $1\frac{1}{2}$  to 2 cm in diameter. The œdema is very much reduced. The granulations appear very pale. Same treatment.

*May 23d.*—Patient has been in the country since the 19th of this month attending to some business, and he has neglected his ear entirely, not even changing the dressing. The discharge has increased very much.

*June 12th.*—He has been treated daily, occasionally the soft granulations have been superficially scraped. To-day the wound is almost closed; it was covered with plaster.

*June 15th.*—Wound completely closed. Patient dismissed.

The protracted recovery in this case must be attributed to the large cavity in the bone. As I have already demonstrated before by the post-mortem examination in case No. 6

of this series, the defect produced in the mastoid is covered by the formation of a dense connective tissue without the least trace of bony substance. After such a great loss of substance in the mastoid region where the destructive process has extended as far as the innermost layers of the skull and even partly impaired these, the foundation for the budding of granulations is very poor. These granulations, after having obtained a certain thickness, are, consequently, poorly nourished, appear pale, and have a tendency to decay. The main material for covering such an extensive cavity must be expected to proceed from the external skin and the periosteum, and everything therefore must be done to facilitate this process by removing all the undermined portions of the external plate, thus avoiding all sharp edges of the bone. In this case the cavity obtained in the mastoid was well adapted for this mode of reparation, but by filling the cavity too densely with gauze, the edges of the external incision had become dry, probably partially covered with epidermis, and it was only after frequently scraping them superficially or cauterizing, that they began to granulate. These granulations, spreading over the edges of the bone into the cavity, soon filled the same, and after the usual retraction had taken place very little depression was noticeable.

**CASE 37.—Acute Purulent Inflammation of the Left Middle Ear ; Mastoiditis by Eburneation of the Bone ; Operation, Obtaining Communication without Finding the Antrum ; Cure in about Five Months.**

A. A., thirty-two years old, from Murray, Idaho, consulted me February 22, 1888, stating that on February 16th, in the evening, he was taken with severe pain in the left ear, and the following day it began to discharge profusely. Ever since he has been applying hot poultices to relieve the pain, but without effect. He is unable to sleep, and the discharge has been increasing. Patient, a strong, well-developed man, has never before been sick, nor has he ever had any affection of the ears. I found the meatus filled with muco-purulent discharge ; after removal of the same by syringing and drying, the membrana tympani very much injected, with a small pulsating perforation upwards and



backwards. The mastoid region was œdematous, but not sensitive to pressure.

*Treatment.*—The perforation was enlarged downwards, and after inflating and syringing with a 2-per-cent. carbolized solution, a Priessnitz bandage was applied. This was followed by immediate relief.

*February 23d, A.M.*—He had but little pain during the night, but he did not sleep. There is very profuse purulent discharge. Same treatment as yesterday.

*February 24th.*—Copious discharge, swelling of mastoid region, and pain upon pressure. Same treatment. Advised patient to go to the German Hospital, where I saw him in the afternoon and ordered one third of a grain of morphia at bedtime.

*February 25th.*—He had no pain, but could not sleep. The discharge and swelling not having decreased, I decided to operate at once.

*Operation.*—Ether narcosis. Dr. J. F. Morse kindly assisted me. After the usual preparations I made an incision parallel to the posterior insertion of the auricle, several centimetres long, through the soft external integuments, which were œdematous and slightly infiltrated. The periosteum was firmly attached to the bone and pushed aside, exposing the external surface of the latter, which was normal. Spina supra meatum well developed, but the multiple openings for the emissary vessels were unusually far forward and were situated in the anterior surface of the posterior wall of the external meatus. This made me suspect already an abnormal condition of the bone. The linea temporalis also, though marked, was very flat and broad, making a short curve upwards. I began to work with chisel No. 1, but after penetrating one centimetre through very dense bone substance I had to resort to finer instruments. At the depth of two centimetres the bone had not changed its character, I penetrated carefully still deeper, and had reached over  $2\frac{1}{2}$  cm when I gave up the idea of finding the antrum. While the bone as far in as 2 cm. was almost like ivory, white and bloodless, I noticed that in deeper portions it was more injected and slightly softer. At this depth, in such high degree of eburnification, it would not be wise to use a broad chisel. Here, as a rule, the operation is ended with the finest chisel, with 2 mm width at the edge, but before ending, when it is thought dangerous to proceed with the mallet, the chisel can be used as a drill by making rotatory motions.



In this manner the canal is somewhat enlarged, its edges smoothed, and the character of the deeper-seated portions of the bone often ascertained. This manipulation is very much used in Schwartze's clinic, and I even recollect a case in which on the point of being abandoned the antrum was thus reached. Patient was then allowed to come to, a forced injection in the meatus was tried, but no communication obtained. After syringing and cleansing, the cavity in the bone was packed with iodoform gauze, otherwise dressed and bandaged as usual, with necessary precautions to prevent the wound in mastoid from being infected by the discharge from the external meatus.

P.M.—Patient complains about dull pain in the head, and he was allowed one third grain of morphine at bedtime.

*February 26th.*—Mrs. A——, who was taking care of her husband, informs me that he was very restless the first part of the night; he got up several times and walked the floor, complaining about great pain in the head. The resident physician gave him some morphine, which produced rest towards morning. Patient tells me that the pain was entirely located in the left side of the head, but that it was not as severe as the night previous. This morning he looks much better; he rested well, feels stronger, and has no pain. The bandage was removed and found dry, the discharge from the meatus so much decreased that it had hardly saturated the gauze which was placed in it. The gauze filling the mastoid was removed, and its deepest portions showed slight signs of purulent discharge. After irrigation with carbolyzed water the mastoid was dressed in same manner; the meatus was carefully dried after inflating and syringing and filled with absorbent gauze. Same dressing.

*February 27th.*—He had considerable pain during the night, no fever; one third of a grain of morphine had no effect until morning, when he suddenly felt much better and slept a couple of hours. This morning he looks better and feels stronger. There was but very little pus in the meatus, but the gauze in the mastoid was saturated with it. Irrigation was used, but no forced injection, because the patient felt faint during the dressing. Prescribed three grains of hydrarg. cum creta.

*February 28th.*—He had less pain last night. Temperature 38.5° C. No opiate. Little discharge in the meatus, more in the mastoid. Forced injection of carbolyzed water into the meatus, passing well through the mastoid. Same dressing.

*February 29th.*—Fair night, hardly any pain, no fever. Forced injection with same result as yesterday, same dressing. He will get up a couple of hours.

*March 1st.*—Sharp pain during the first part of the night requiring an opiate. The meatus is almost free from discharge; same amount from the mastoid. With forced injection the same communication exists, but its exact place cannot be ascertained on probing.

*March 6th.*—The last few days he had more or less pain, but the general improvement is well perceptible. The cavity in the mastoid is granulating nicely. To-day he leaves the hospital, and he will from now on be treated as an out-door patient.

*April 14th.*—Patient has been treated twice daily till March 18th, then once daily. Lately the discharge from meatus has had a serous character. The memb. tympani, still inflamed and thickened, shows a perforation 3 mm in diameter situated in post. sup. segment.

*April 21st.*—The cavity in the mastoid is so much reduced that I left off packing it with gauze. He has had the same treatment daily, and gradually the communication between cavum tympani and mastoid has stopped.

*May 7th.*—Business compels patient to leave for his home. He has now no more discharge from the meatus, but the perforation, though small, still exists. The tuba has always been found very free when inflating with the catheter. On the mastoid is a well marked depression; the external opening of the fistula is slit-shaped and about  $1\frac{1}{2}$  centimetre deep. Patient will be dressed daily by his wife with a  $2\frac{1}{2}$ -per-cent. carbolized water and the necessary antiseptic precautions. When at home he will apply to his family physician. As he informed me later on he treated himself for about two months before the mastoid was entirely closed, and adds: "The hearing is now almost as good as before," etc., etc.

**CASE 38.—Chronic Otorrhœa of Right Side; Caries of Mastoid Accompanied by Delirium; Removal of Posterior Osseous Wall of the External Meatus; Cure in Six Weeks.**

John A. L.—, 25 years old, has had otorrhœa in right side since he was seven years of age. Two years ago he had a swelling behind the ear, which was incised by a general practitioner, and the after-treatment carried on by a specialist. On the 19th

of March, 1888, Dr. J. F. Morse was called in to see the patient. He found him frantic and delirious with intermissions of comatous condition. He had a very profuse fetid discharge, no swelling of the mastoid region, but pressure upon the same would bring on the delirious spells. On the 28th I went with Dr. Morse to see the patient. We found him in bed, hardly conscious, and the least pressure upon the mastoid brought on the same delirious condition. The mother was advised to take the patient to the German Hospital for operation.

*March 30th.—Operation:* Ether narcosis; antiseptic precaution taken. The profuse discharges from the external meatus has ceased. In the mastoid region, about 2 cm from posterior insertion of the auricle, a cicatrix 5 cm long, in the centre of which was a navel-shaped depression extending into the bone. I made my incision as usual close to the posterior insertion of the auricle, but when I tried to detach the periosteum backwards, found the same firmly attached to the depression above described. After dividing these attachments I was able to force at this spot a probe into the bone and ascertain that there was a large cavity in the mastoid. This sinus was enlarged with chisels and hammer to the size of  $1\frac{1}{2}$  cm, exposing a cavity filled with cheesy substance. Its contents were scooped out carefully, and thoroughly irrigated with carbolized water, which ran profusely from the meatus and also from the mastoid when irrigating into the meatus. The cavity was packed with iodoform gauze.

*March 31st.*—No fever. Patient slept well. His general condition is better; he is conscious. The dressing was partly removed, and the mastoid well irrigated with carbolized water.

*April 5th.*—He has been treated daily; his general condition improving from day to day. I found him reading the newspapers. After removing the gauze in mastoid I discovered some loose cholesteatomatous masses which I removed with the forceps. Dressed and bandaged as usual.

*April 7th, A.M.*—I found a younger brother taking care of the patient, who stated that patient was at times delirious. At present he is perfectly rational; no fever; wound in perfect condition. Same dressing.

*April 8th.*—Nothing abnormal; usual treatment.

*April 9th.*—I found patient delirious, in which condition he has been since 12 o'clock last night; he tore off the bandage,

and he speaks constantly in a confused way. When spoken to he answers and comprehends what is told him. I found nothing abnormal about the ear, and treated and dressed him in usual manner. Following the advice of Dr. C. M. Richter, who accidentally was present, I ordered one grain of opium every three hours.

*April 10th.*—He is still more irrational to-day; he does not answer any more when spoken to. He has taken one grain of opium every three hours, and has had an ice-cap on continually. No fever; pulse 75, small but regular. Dressed as usual, but with simple gauze, moistened in carbolyzed water.

*April 11th.*—The opium and ice have been continued; his condition is even worse. There is very little discharge from the meatus as well as from the mastoid. During irrigation, patient becomes unmanageable, and gradually recovers when it is discontinued.

*April 12th.*—He remains about in same condition; was worse for a short time, striking blows to the nurses and at the wall, and had to be isolated. Has been taking opium and bromide with iodide of potassium. He only recognises his mother. No fever. Bandage was kept on; very little suppuration; same dressing.

*April 13th.*—He has been more rational since the change of dressing yesterday. This morning though rational he is still very slow in giving answers; he also slept a part of the night. He sat on a chair to be treated. The mother, who is attending to him, states that patient complains of pain all over the body, and that he vomited yesterday afternoon and again early this morning. No fever; pulse 80. Discontinued opium; prescribed bromide and iodide of potassium, besides milk and beef-tea diet, six ounces of whiskey daily.

*April 14th.*—Patient feels very weak, but gives rational answers. After being dressed he was very anxious to get to bed, and slept.

*April 15th.*—He looks much refreshed; laughs and speaks to every one.

*April 16th.*—Same as yesterday, only that he complains about a little headache at forehead. Ordered ice-cap. There is very little discharge and very free communication. Same dressing.

*April 17th.*—He has slept well and wishes to leave the hospital.

*April 18th.*—About 10 A.M. he called at my office accompanied by his mother, who stated that at 1 A.M. and again at 6 A.M. her son had been flighty for a short time. He is now perfectly rational. There is moderate suppuration from the mastoid; communication very free.

*April 19th.*—A small polypus in upper and post. wall of external meatus, and two small granulations in the middle ear were cauterized with nitrate of silver. The opening in the mastoid is now closing rapidly; it still measures 3 *cm* including the soft external tissues. The bandage was dispensed with and a spring applied April 23d. The malleus was still present, and its handle is entirely denuded; it was removed with difficulty, and found disfigured and necrotic.

*April 24th.*—He had some pain during the night and felt very faint; he feels well this morning.

*May 15th.*—Has had daily treatment and has been wearing a rubber drain which was removed to-day, and a lead nail adapted. The discharge is very slight. He has gained flesh and now looks robust.

*May 30th.*—Nail reduced in size but not shortened. Daily treatment.

*June 5th.*—Fistula scraped with sharp scoop. During the entire months of June and July patient has had daily attendance; the communication has always been very free. Once each month the granulations in the mastoid were scooped out and repeatedly cauterized. During the months of August and September he was treated three times a week, and the mastoid scooped out once. During October a 2 per cent. solution of creolin was used for syringing, but without any benefit. It produced considerable smarting sensation, and the discharge became green. It was therefore abandoned and a solution of sublimate 1:1000 used instead. With the latter the discharge ceased entirely, November 3d, and the nail was left out November 17th. The fistulous opening was kept closed with a plug of cotton. There is now in the mastoid a cavity with smooth walls, with a small 3-to-4 *mm*-wide fistulous opening externally, in which November 14th a lead nail had to be applied again, it having contracted considerably when it was left out.

*November, 1889.*—During the past twelve months he has presented himself seven times. There has been no more discharge, he has worn the nail continually held in by a spring. The walls



of the middle ear and the cavity of the mastoid well lined with epidermis and dry. The external meatus is separated from the cavity in the mastoid by the posterior osseous wall or anterior surface of the mastoid. This partition is wedge-shaped, being wider externally (about 1 centimetre), gradually decreasing in thickness the nearer the middle ear. The aditus ad antrum was very much enlarged by caries of its exterior wall; thus a wide communication existed between the mastoid, cavum tympani, and external meatus. Under these circumstances I was convinced that the present condition was a permanent one, and decided, in order to get rid of the fistula in the mastoid, to remove the entire partition between the mastoid and external meatus, and thus obtained a larger cavity with one orifice, the natural orifice of the meatus.

*Operation—February 13, 1890.*—I made a semicircular section close to the posterior insertion of the auricle, detaching it entirely from the bone. With a periosteotome I detached the cutaneous post. lining of the external meatus from its osseous wall as far in as it reached. The auricle was then drawn forward by a strong sharp retractor I had constructed for this purpose, held by an assistant. I then chiselled away with gouge and mallet the wedge-shaped partition between mastoid and meatus as far as the middle ear. Though the hemorrhage was very slight, it still required very rapid sponging to ascertain the true condition of things in the depth, most of this work being done with Schwartze's gouge and mallet, and only small projections snipped off with my bone forceps. The cutaneous lining of the external meatus was then divided lengthways by a section in its posterior wall, extending from its attachment to the cartilage to its inner end. The cavity of the mastoid was well scraped with scoops. The auricle brought back to its insertion by uniting the wound with several sutures. The meatus was well irrigated, plugged with iodoform gauze to allow its cutaneous lining to spread, and antiseptic dressing applied. The necessary precautions had been taken in the room of the patient in case of delirium.

*February 14th.*—He received last night two grains of opium, he slept well, has no fever. As the bandage was impregnated with blood, it was removed and renewed.

*February 15th.*—No fever, but upon request received some chloral and bromide last night.

*February 18th.*—Leaves the hospital to be treated as out-door patient. There has been no reaction from the operation. There



is but little discharge, and is dressed daily as the pus accumulates in the mastoid.

*February 28th.*—He has been attended daily, irrigated with large quantities of carbolized water. The wound of the mastoid did not heal by first intention; the stitches had to be removed early to facilitate treatment. The discharge was for a few days comparatively profuse but decreased very rapidly. The meatus has widened very much, its cutaneous lining having spread and become attached to their respective sides. On the ridge left downwards of the osseous wall are some granulations, which, March 5th, had to be cauterized. During March patient has been treated at an average of twice a week, and is now, April 3d, in the following condition. The upper portion of the posterior wall was chiselled away, making it smooth with the roof of the defect in the mastoid, except at its inner end, where it forms a portion of the wall of the aditus ad antrum. The lower portion was not removed so well, and a portion of it being left, appears now as a low ridge dividing the meatus from the cavity in the mastoid in its entire length. Only a very small portion of the anterior wall of the aditus was removed, and this is now closed by a cicatricial band. Not only the meatus, but also the labyrinth surface of the middle ear, the ridge of the osseous portion of the meatus left as well as the cavity in the mastoid, are lined with epidermis. The wound on the mastoid is slightly drawn in but closed.

The result obtained is in my opinion a great one, so far as the fistulous opening on mastoid is done away with, there is no more need for a nail and spring, and the communication with the external meatus, such that no fear can ever be entertained as to the retention of macerated epidermis, or any other formation. This result of this operation probably differs from those performed by Küster, in the fact that the cavity in the mastoid remained almost as large after as before the removal of the osseous wall.

**CASE 39.—Chronic Bilateral Dry Catarrh of the Middle Ear with Thickening of the Membrana Tympani; Acute Catarrhal Inflammation of the Middle Ear Ending in Empyema Mastoidei; Operation; Cure in Four Weeks.**

Mrs. L. L. B.—, forty-eight years old, from Los Angeles, Cal., came under my care March 24, 1889, giving the following his-

tory. She is the mother of a large family and had always enjoyed the best of health until about two months ago when she contracted a severe cold. One week later her left ear began to pain, which lasted with short intermissions for about six weeks. At times the pain was very intense and accompanied by swelling behind the ear. She never had any discharge from the ear. Two physicians attended her; the first was discarded after he proposed an operation on the bone, the second treated her with insufflations of boracic powder. The last two weeks she has had no pain; her general health is poor; she feels debilitated, having lost considerable flesh; her complexion is at present of a dirty-brown-yellow (Mexican); the tongue is coated; has no appetite, and has no motion of the bowels.

*Status Præsens*: Externally nothing abnormal; regio mastoidea n. meatus normally wide; memb. tympani thickened and congested; hearing,  $h = 0.1:5$ . With catheter tuba found very free, no râles, followed by improvement of hearing  $0.25:5$  and a lighter feeling of the head. R. memb. tympani thickened,  $h = 0.2:5$ , tuba free.

I then diagnosed the case as one of bilateral chronic dry catarrh with thickening of both memb. tympani, with acute relapse in left side extending into the antrum. I advised daily inflations and dry cotton bandage day and night.

*April 2d.*—Patient called at my office stating that she had been in bed attended by Dr. Rivas since she last saw me. The doctor was trying to improve her general condition thinking that then she would be better fitted to have the ear attended to. But her health has not improved, and she has had so much pain during the last two nights that she has not slept at all. On examination I found redness and swelling of the left mastoid region as well as sensitiveness on pressure. Ext. meatus and memb. tympani in same condition. I applied iodine to mastoid region and ordered continual application of ice-bag. In the afternoon I was sent for, the ice had been applied but, producing considerable pain, it had to be abandoned. Patient had slight fever. I applied a Priessnitz bandage.

*April 3d., A.M.*—Had pain during the night; the swelling of mastoid region has increased; it extends down into the neck, producing œdema. Priessnitz renewed, and informed patient that I would not postpone the operation later than the 4th in the afternoon. Consultation with Dr. Rivas. Same condition as in the morning, temperature  $39.2^{\circ}\text{C.}$ , anodyne, Priessnitz.

*April 4th.*—Bad night again with considerable pain, temp.  $38.4^{\circ}$  C., Priessnitz. At 4 P.M. operation, Drs. Rivas, Pinkerton, and Morse assisting.

*Operation:* Narcosis with Billroth's mixture. The usual shaving and antiseptic precautions taken, I made an incision close to the post. insertion of the auricle through the soft integuments, which were about one centimetre thick. This was accompanied by copious parenchymatous hemorrhage, which was stopped by compression and one ligature. The bone was denuded of periosteum, its surface rough. The linea temporalis and spina supra meatum not well defined, and no openings for the emissary veins visible. Thus the spot of selection for the operation was not characteristic. I began chiselling and had penetrated no deeper than 2 or 3 mm when pus made its appearance. With a steel director I then penetrated into a cavity of the bone and satisfied myself that we had before us a case of empyema of the mastoid. The external opening was enlarged with the chisel, until it measured 2 cm in vertical by one in horizontal direction. The pus oozed out as if it had been under pressure. The walls of the cavity, which was  $2\frac{1}{2}$  cm deep, were lined with granulations and cheesy substance, which were scooped thoroughly. After irrigation with carbolized water, the cavity was packed with iodoform gauze and antiseptic dressing applied. At 8.30 P.M. temp.  $38.4^{\circ}$  C. Patient has taken some tea and feels well.

*April 5th, 8.30 A.M.*—Temp.  $37.6^{\circ}$  C.; had some sleep; her complexion has cleared so much that it was noticed by every one present; she stated that the heavy pressure in the head has disappeared, and that she only feels a little weak. The external dressing as well as a portion of the gauze in the mastoid were removed on account of being saturated with blood, and renewed. She asks to be allowed to sit in bed. Will take fluid food.

*April 6th.*—Slept during the night, no pain except stiffness of the neck. Temperature, A.M.,  $37.4^{\circ}$ ; P.M.,  $37.6^{\circ}$ . Dressed same as yesterday.

*April 9th.*—The temperature has never been any higher than  $37.4^{\circ}$ . The dressing has been renewed daily, the mastoid irrigated with carbolized water and packed with iodoform gauze. The wound begins to granulate. Patient has good appetite and will get up to-day.

*April 16th.*—She has been treated daily; the cavity in the mastoid is filling so rapidly that to-day I had to insert a conical lead nail,  $2\frac{1}{2}$  cm long, held by a spring.

*April 20th.*—Daily attendance. Nail shortened  $\frac{1}{2}$  cm.

*April 23d.*—After cauterizing fistula with pure nitrate of silver, shortened nail still more.

*April 24th.*—I left the nail out.

*April 29th.*—Wound in mastoid closed, protected by plaster.

*May 1st.*—Last night at 12 P.M. she had a chill and at 2 A.M. sent for Dr. Pinkerton.

*May 2d.*—Consultation with Dr. Pinkerton, who prescribed some quinine as no connection with the ear could be detected.

*May 9th.*—Patient was dismissed with hearing,  $h = 0.75:5$ . The cicatrix on mastoid still red, not painful to touch. Memb. tympani thickened and still slightly injected.

A great deal of details that are noted in my journal have been left out of this publication. I will only remark that this case was one of the so-called dry catarrh of both middle ears with thickening of both memb. tympani, which had been in existence for several if not many years. The cold contracted was accompanied by an acute catarrhal inflammation of the left middle ear and antrum. This process receded in the cavum tympani, but by some reason unknown to us became of purulent character in the antrum, destroying the bony cell walls and transforming the inner portion of the mastoid process into a cavity filled with pus and lined with granulations. If we accept the theory that there is no suppuration without infection with germs, we have to admit that the infection here proceeded from the middle ear through the tube, that at an early period the inflammation in the cavum tympani must also have been of purulent character but receded, and that the process in the mastoid only progressed because it had become incarcerated, all communication between cavum tympani and antrum being suspended. Similar cases of catarrhal inflammation of middle ear ending in empyema or central caries of the mastoid are very frequent (see cases Nos. 13 and 17 of these publications).

**CASE 40.—Acute Purulent Inflammation of the Right Middle Ear; Caries Necrotica of Mastoid; Operation; No Communication; Cure in about Six Weeks.**

C. F. H., male, thirty-nine years old, first came under my care April 10, 1888, and gave the following account of his trouble. During the night of March 8th his right ear began to discharge

bloody purulent matter ; this was accompanied by pain, which lasted during five days. The pain then began gradually to decrease and he went to work, but it has now increased so much that he is not able to sleep. The last two days he noticed a swelling of his neck below the ear.

*Status Præsens* : Profuse otorrhœa in right side, with swelling of the walls of the external meatus and swelling of mastoid region with œdema of the neck. Temperature  $102^{\circ}$ .

*April 11th.*—Temperature  $100^{\circ}$ .

*Operation* : Incision made in usual manner, soft tissues infiltrated, slight hemorrhage, periosteum partly detached from the bone, external plate slightly discolored. Spina supra meatum well developed, while the linea temporalis, as well as the emissary openings, are not well marked. The external plate, where the bone was most discolored, was only 1 mm thick, then came a layer of flat air-cells filled with pus. Under these cells the bone was again very hard to a depth of 2 cm, when the antrum was reached and found full of pus and granulations. These were scooped out, producing considerable hemorrhage, the total depth of the cavity in the bone measuring then 2.5 cm. After the patient had recovered from the narcosis a forced injection in the meatus was tried, but no communication obtained. The cavity was filled with iodoform gauze and antiseptic dressing applied.

*April 12th.*—Last night temperature  $102.3^{\circ}$ . The pain was very severe the first part of the night, but it then gradually decreased and he slept well the balance of the night. This morning he looks well, temperature  $99^{\circ}$ . There is almost no discharge from the meatus. The bandage, as well as the gauze in the meatus, was found impregnated with blood, which was still oozing through the same. A fresh dressing was applied, using some compression. Patient fainted during the dressing. In the evening temperature  $100^{\circ}$ .

*April 13th.*—He had no pain during the night and slept well. Temperature  $99^{\circ}$ . There is no discharge from the meatus. The gauze in the meatus was removed and a forced injection tried, but still no communication was obtained. The wound was well covered with iodoform, the cavity refilled with gauze, and dressed in usual manner.

*April 17th.*—He has been improving and attended daily. A portion of the external plate surrounding the orifice is very much discolored. No suppuration from the meatus and moder-



ate from the mastoid, which is now beginning to granulate. He leaves the hospital.

*April 19th.*—The granulations are growing so rapidly that a rubber drain-tube had to be inserted.

*April 21st.*—The portion of the bone which was discolored appears much healthier, and I applied two sutures in lower angle of the external wound to draw its edges together and thus protect the bone.

*April 23d.*—Roll bandage left off and dressing held by head-spring.

*April 24th.*—Removed sutures, granulations cauterized with nitrate of silver.

*April 30th.*—The drain-tube was exchanged for a conical lead nail 2 cm long.

*May 5th.*—Nail left out because it would not remain in position.

*May 7th.*—The posterior edge of bone at the external orifice in mastoid, being very sharp and discolored, was snipped with Luer's forceps and rounded off.

*May 10th.*—The granulations in mastoid very sluggish, bleeding easily; they were cauterized thoroughly and the lead nail re-inserted.

*May 21st.*—Nail again left out and granulations in bone well cauterized.

*May 28th.*—Only a fine probe can be introduced in the fistula, which is still  $1\frac{1}{2}$  cm deep.

*June 6th.*—Wound perfectly healed. Memb. tympani thickened, slightly congested, hearing  $h=0.5:5$ .

The only difficulty experienced in the healing process of this case is that the periosteum had been separated from the bone to a greater extent than necessary. This was done because the bone was discolored, and I expected to have to remove some more of it at a later period. Besides, the edges of the orifice had been left very sharp, which is always an obstruction for the granulations from the soft integuments to extend into the cavity. Whenever we have a large cavity in the mastoid the sooner the granulations of the external soft parts (cutis and periosteum) extend into the same, the sooner consolidation takes place, by forming a dense cicatricial tissue, drawing in the cutis and periosteum. This will



naturally only then be the case when all the diseased bone has been removed from the mastoid process.

**CASE 41.—Acute Purulent Inflammation of the Right Middle Ear Extending into the Mastoid; Operation; Communication; Cure in Seven Weeks.**

Geo. W. Th——, male, thirty-five years old, I first saw in the German Hospital, April 18, 1888. He had been admitted April 16th, stating that three weeks previous he had measles; April 15th he had severe pain in the right ear and right side of the head, for which he used some drops prescribed by a physician. He had no discharge from the ear and no swelling of mastoid region. On admission the temperature was  $101^{\circ}$ . Warm fomentations and leeches were applied. During the night the ear discharged freely. April 17th and 18th the temperature was normal; the discharge from the ear and the pain have not changed. This condition lasted until the 23d of April when he was operated.

*Operation:* Incision 4-5 cm long, periosteum easily detached from the bone. The external plate showed about 1 cm behind the spina a bluish-gray discolored spot. Spina supra meatum well defined. The emissary canals not noticeable. At a depth of 3 mm I found several small cells containing pus; under these the bone was again hard, then still deeper a few more cells were found full of pus. I penetrated 2 cm deep, finding but small cells divided by heavy trabeculæ. A forced injection was tried the fluid passing freely from the meatus into the mastoid. All attempts to find a larger cavity or antrum failed. After syringing he was dressed as former cases.

*April 24th.*—As he complained of a great deal of soreness the resident physician gave him an opiate. Moderate purulent discharge from the meatus; the gauze in mastoid also impregnated with pus. To-day no communication obtained. Dressing renewed.

*April 25th.*—Same condition as yesterday. Temperature  $100.2^{\circ}$ . He still complains of more or less pain during the entire night.

*April 26th.*—Profuse discharge from mastoid, but very little from the meatus, otherwise same condition as yesterday.

*April 27th.*—For the first time he feels very well, having had but little pain during the night. There is almost no discharge from the meatus, but very copious from the mastoid.

*May 2d.*—April 27th in the afternoon he got up and walked in the garden. April 29th and 30th I was prevented from attending

the hospital and patient was dressed by the resident physician, who informed me that the suppuration had increased daily. To-day it is very profuse both from meatus and mastoid. There is no communication. Temperature  $100.3^{\circ}$ .

*May 3d.*—Temperature  $101^{\circ}$ . Same amount of discharge; considerable pain. Fearing retention of pus, probably because the antrum was not reached, I again scooped out the cavity thoroughly, penetrating a couple of millimetres deeper; the bone was very compact and the antrum was not found. By forced injection no communication was obtained. External meatus wide. Membrana tympani injected, with pulsating perforation in post. portion. Catheter introduced; tuba impermeable. Patient kept in bed. Antipyrin prescribed, fifteen grains three times a day.

*May 7th.*—Patient has been treated twice daily. He has had no fever and but little pain. To-day he looks better; the discharge is now decreasing, but still plentiful. Granulations are forming so rapidly that a drain-tube had to be introduced.

*May 18th.*—Hardly any change has occurred, the discharge remaining about the same. To-day the temple and right side of the face are swollen, to which ice was applied.

*May 21st.*—Swelling of face and temple receded. Ice discontinued. Discharge much less. The drain-tube was replaced by a conical lead nail.

*May 29th.*—Since the 21st the nail has been shortened twice. Moderate discharge. A polypus covering the memb. tympani was removed with cold snare. It originated in the middle ear and found its way outwards through the large perforation of the membrane.

*May 30th.*—The discharge has completely, and I may say suddenly, ceased.

*May 31st.*—Nail reduced again in size and length.

*June 5th.*—Nail shortened again and fistula scraped.

*June 7th.*—Fistula scraped again and nail left out.

*June 15th.*—Wound in mastoid completely closed. Memb. tympani slightly red and thickened; perforation closed; malleus not yet visible. With the catheter the air penetrates by strong pressure only. Hearing  $h = 0.01:5$ .

**CASE 42.—Acute Purulent Inflammation of the Middle Ear; Imperfect Communication and Retention of Pus after the Operation; Cure in about Six Weeks.**

J. I——, female in the thirties, consulted me May 1, 1888, and gave the following statement: Last January she had an earache

in the right side followed by discharge. Ever since the ear has been discharging, and the pain, which has never left entirely, has been very severe at intermissions. April 21st she had several spells of dizziness and was compelled to stay in bed. April 22d the pain was very severe and her family physician applied leeches to the mastoid region.

*Status Præsens* : The external meatus found full of greenish purulent discharge, macerated epidermis, and inspissated pus. The meatus very much constricted, its walls red and swollen, more so the nearer the fundus, thus preventing a good inspection of the membrana tympani. With the catheter the tuba was only permeable on strong pressure, followed by whistling sound accompanied by râles. Mastoid region not swollen, very sensitive on pressure at point of selection.

*Treatment*.—After cleansing the external meatus with carbolized water a Priessnitz bandage was applied.

*May 2d*.—She had a good night's rest, the first for two weeks. Same amount of discharge. Tube not permeable. Same treatment.

*May 3d*. Did not rest well during the night on account of pain. This morning the discharge was very much increased.

*May 4th*.—Patient had a good night. Same condition in the ear. Ordered repeated instillations of hot water every two hours.

*May 30th*.—She has been treated in the same manner: syringed with carbolized water, frequent instillations of hot water, Priessnitz at night, and inflations with catheter. Only at times the tube has been permeable to air by strong pressure. The discharge has been at times moderate, at times again very profuse. The pain has not changed in character, and she has frequent spells of dizziness. I repeatedly have advised her to submit to an operation, to which she only consented June 13th, when, besides aggravation of the symptoms already described, the external meatus was almost completely closed by swelling of its walls, and the mastoid region œdematous. Patient's general condition is very bad: she is emaciated, slightly icterical, the tongue coated, and has continually some elevation of temperature.

*Operation* : June 13th in the German Hospital. Ether narcosis. After shaving and disinfecting an incision was made parallel to insertion of auricle through the normal external tissues. Periosteum well adherent to the bone, the mastoid appendix of medium size, the place of selection very much depressed and discolored, the emissary vessels well marked, and the spina supra meatum well

developed. After chiselling through the external plate, which was 3 mm in thickness, pus appeared. An external opening was made of  $1\frac{1}{2}$  by 2 cm, and then the contents of the mastoid, consisting of softened bone substance, inspissated pus, and granulations, was thoroughly scooped out to the healthy bone substance. It was then well irrigated with carbolized water, no communication having been obtained, the cavity filled with iodoform gauze and dressed antiseptically. At 7 P.M. temperature  $100.1^{\circ}$ .

*June 14th.*—Temperature  $99.8^{\circ}$ . She had much pain during the night, moderate purulent discharge from the meatus. The gauze in the mastoid was not disturbed. Syringed with carbolized water and dressed same as yesterday.

*June 15th.*—Last night temperature  $100.9^{\circ}$ . Patient states having had much pain during the night. There is now almost no discharge from the meatus but considerable from the mastoid. I removed all the gauze in the mastoid, syringed with carbolized solution, but no communication was obtained. Dressed in same manner.

*June 16th.*—Temperature  $99^{\circ}$ . She had no pain, but could not sleep during the night. Very little suppuration as well from the meatus as from the mastoid. Still no communication obtained in syringing. Same dressing.

*June 17th.*—Temperature  $99.4^{\circ}$ . Considerable pain during the night. Moderate discharge from meatus as well as from mastoid. Same treatment.

*June 18th.*—Temperature  $98.6^{\circ}$ . No pain. She insists upon leaving the hospital to-day. Profuse purulent discharge from the mastoid but scarcely any from the meatus.

*June 19th.*—Patient called at my office and stated that she had much pain during the night. The discharge from the mastoid is very copious and but very little from the meatus. I inserted a rubber drain in the mastoid and held it in position by packing iodoform gauze around it.

*June 23d.*—She has been attended daily, her condition not changing materially. The soft tissues of mastoid which were granulating very fast had to be cauterized repeatedly. The discharge has been moderate. The most distressing symptom is the almost constant dizziness. To-day I left out the rubber drain and replaced it by a conical lead nail  $1\frac{1}{4}$  cm in length, held by a spring.

*June 26th.*—The insertion of the nail has had no effect upon

the discharge, which is still profuse. She still feels dizzy, but has no pain and sleeps well. On syringing the mastoid the fluid passed into the throat and through the external meatus, showing that communication was obtained. The external meatus is now more swollen than ever, its lumen slit-shaped. I concluded that there was retention of pus in the antrum or elsewhere, and left the nail out, cauterized the mastoid thoroughly with nitrate of silver, and dressed with iodoform gauze.

*July 2d.*—Has had daily attendance. On syringing the mastoid the fluid always passes into the throat, at times through the meatus. The discharge though moderate has decreased very much. Same treatment.

*July 14th.*—Patient states that after yesterday's treatment, which was the same as usual, she had very much pain and was in bed all day, having nausea but no vomiting. The discharge from mastoid as well as from the meatus has again increased.

*July 15th.*—Neither pain nor dizziness. Very little discharge. On syringing communication obtained. Swelling of external meatus very much reduced.

*July 17th.*—Left off bandage, replaced nail.

*July 23d.*—Still very little discharge. No pain or dizziness. Nail shortened and reduced.

*July 27th.*—Nail reduced again. Is treated every second day.

*August 1st.*—The nail fell out and was not replaced immediately, the fistula almost closed. The nail was left out.

*August 4th.*—Patient has not called for three days. I can still enter fistula with a probe to the depth of one centimetre. After washing with carbolyzed water it was covered with a piece of adhesive plaster. Still complains of dizziness.

*August 8th.*—The fistula entirely closed, the meatus almost normal, the membrana tympani thickened and injected, but no details in the same visible. Hearing  $h=0. \frac{3}{4}$ .

*August 29th.*—Patient called to see me. Her ear is in perfect condition, but she still complains of dizziness. Her general health has very much improved.

The treatment in this case can be subject to criticism because, though I was aware that there was all the time retention of pus, still very little was done to relieve the same. In the first place, when the patient first came, or at any time during the month of May, I should have tried either to



enlarge the already existing perforation, or, if this was not visible to make a paracentesis at any point of the membrana tympani still visible. This was delayed until the swelling of the walls of the meatus had completely closed its lumen and it was no more practicable. In the second place, it would then perhaps have been advisable to make several deep incisions in the walls of the meatus to reduce its swelling. I have never resorted to these incisions, because if made before opening the mastoid there is no need for them, as then the swelling in the meatus recedes very rapidly. The intermissions in the amount of discharge, which was one day very copious, to become scanty in a few hours and again very profuse, indicate that there was retention of pus. Whether the retention was only in the cavum tympani, or at the same time in some cavity of the bone which was not reached, perhaps the antrum itself, remains undecided. Unfortunately the depth of the cavity made by the operation was not measured, but I know that it exceeded two centimetres, and its walls were so smooth that it was then supposed that the antrum was included in the same. The continual dizziness may have been produced by the increased pressure on the stapes, by the retention of pus in the cavum tympani, but most likely by hyperæmia of the adjoining intracranial organs, as it lasted several weeks after the suppuration had ceased. During the treatment I made once an ophthalmoscopic examination and the fundi were found normal.

**CASE 43.—Chronic Purulent Inflammation of the Left Middle Ear; Empyema of Mastoid; Operation; Communication; Considerable Improvement; Death from Typhoid Fever Nine Months Later.**

James Mc—, sixteen years old, I first saw in consultation with Dr. H. W. Sawtelle, Surgeon of the U. S. Marine Hospital, July 13, 1888. The doctor kindly informed me that the boy came to see him Tuesday, the 3d, on account of otorrhœa in the left ear, which he had contracted two years previously and had entirely neglected. The 4th, he had severe earache, and became flighty, and has remained in that condition until the present time. I found the poorly nourished boy in half comatose state, from which he



could only be awakened by being loudly spoken to. There was no swelling on the mastoid, but intense pain upon pressure on the same, and profuse putrid discharge from the meatus, which was almost entirely closed from swelling of its walls. It was late in the afternoon, some miles distant from the city, and not being prepared, I decided to operate the following day.

*Operation:* Soft integuments normal, periosteum attached to the bone. Spina supra meatum well defined, external plate normal, very compact, the trabeculae very thick, the air-cells small. At a depth of 4 to 5 mm very fetid pus was found. The work of penetrating deeply and enlarging the small cavities containing the pus was exceedingly hard, on account of the hardness of the bone. This was, as usual, continued until a perfectly clean surface had been obtained in all directions. There is communication only when syringed into the meatus. Dressed with iodoform gauze and bandage.

*July 17th.*—He was dressed yesterday by Dr. Sawtelle. Temperature was 38° C. He feels much better, and has no more delirium, but still complains of some pain in the head. There is moderate discharge from the mastoid and slight from the meatus. Temperature 37.5° C. Syringed with carbolyzed water and dressed with iodoform gauze.

*July 18th.*—There is very little discharge from mastoid or meatus; the walls of the latter are very much swollen. No communication. Same treatment. He sleeps well and has no more pain.

*July 19th.*—Slight discharge from the mastoid, none from the meatus.

*July 20th.*—Moderate discharge from mastoid, none from the meatus.

*July 21st.*—Walls of meatus less swollen, considerable discharge from the mastoid.

*July 22d.*—Moderate discharge from mastoid, slight from meatus.

*July 30th.*—The intermissions in the amount of discharge which has occurred daily show in this, as in case No. 42, that there must be retention of pus. The external wound is granulating profusely; the granulations had to be clipped off with scissors to-day. Very free communication is obtained in syringing, and the discharge has decreased suddenly since the 27th.

*August 1st.*—As the discharge has not increased lately I inserted a nail.

*August 2d.*—Cauterized granulations in fistula.

*August 3d.*—Considerable discharge from fistula. There is still good communication. The cutaneous wound completely closed round the nail.

*August 6th.*—Good communication, the fluid passing clear when the head is held upright. Immediately afterwards the head was held perpendicular, and a large quantity of pus flowed out through the fistula. Probing carefully, I detected in the depth of the mastoid a second fistula running backwards and upwards leading to a cavity. This was separated from the cavity obtained in the operation by a thick osseous wall. I then tried to inject into the cavity with Hartmann's antrum canula, the fluid passing freely through the meatus and running into the throat. I enlarged the fistula in mastoid again and removed with sharp scoops all I could of the osseous bridge separating both cavities. This was accompanied by moderate discharge with well marked pulsations. The direction of the cavity found was so far back that I was convinced the internal lamella had already been perforated, and even that there was an abscess of the brain. The character of the hemorrhage and the exceedingly dark blood prevented me from interfering much more. After carefully syringing, a strip of iodoform gauze was introduced into the cavity and otherwise dressed as usual. The patient appeared to be in perfect condition, never complaining at all.

*August 7th.*—Syringed, obtaining communication. The discharge has decreased very much. Two drains were introduced, one in the fistula running forward, and the other in the second running backwards.

*August 10th.*—There has been no special change, except that the discharge has decreased very much.

*August 13th.*—Moderate very fetid discharge from the meatus. No communication in syringing:

*August 14th.*—There is considerable discharge from the meatus. On syringing through the mastoid, communication was again obtained, washing out some cheesy substance. Upon the slightest touch with the probe backwards, some hemorrhage follows. There was but little discharge through the meatus, and as the rubber drains would not remain in position, a lead nail was again applied.

*August 26th.*—He has had daily treatment, and for the last week communication has not been interrupted. The cavities filled with fungous granulations were scraped to-day.

*August 29th.*—Anterior cavity entirely closed ; syringed through posterior cavity ; communication with the middle ear still exists. The latter was scraped, and the inner end of the nail bent to fit backwards into the same. This could only be done after again removing some of the osseous ridge with sharp scoops. The discharge is still moderate, as well from the mastoid as from the meatus.

*September 27th.*—He had been treated daily, the discharge gradually decreasing. To-day there is no more discharge from the meatus and very little from the mastoid. The nail was shortened to 2 cm and reduced in size.

*October 3d.*—The last few days there has been a little increase in the discharge, which is also fetid again. Having just received creolin, I used a freshly prepared two-per-cent. solution for syringing. It produced unpleasant smarting sensation. The cotton pellet in the meatus was also impregnated with this solution.

This treatment was continued daily until the 8th, when the discharge had decreased so much that the nail, which was still 1 cm long, was left out entirely. By the 12th the fistula had entirely closed and covered with a piece of plaster.

*October 18th.*—Has been treated daily in same manner. There is still slight greenish fetid discharge from the meatus.

*November 12th.*—About in same condition, with catheter râles in the middle ear ; slight fetid discharge. Prescribed a solution of corrosive sublimate (1:1000) to be instilled lukewarm into the ear twice daily. He will call twice a week at the office.

*November 17th.*—Very slight discharge, no odor.

He was treated four times in December, then once a week until April 18, 1889, when his visits ceased, his condition not having changed. His mother now states that on the 19th of April he came home complaining of headache and pain in his head. A physician who was called in diagnosed typhoid fever, and treated him for that until April 29th, when the boy died.

In this, as in the previous case, there was retention of pus. In performing the operation several small cavities filled with very fetid pus were found separated by thick trabeculæ. Whether or not the antrum was open during the operation cannot be decided, the canal made having, through the very hard bone, followed the direction given by Schwartze. The cavity discovered later during the treat-

ment, and which seemed to have been the main seat of the disease, extended so far backwards and upwards that I at once suspected perforation of the inner plate and abscess of the brain. The very profuse hemorrhages of dark blood, with pulsations, cautioned me against too much probing in that direction.

I have since ascertained from the physician who attended, that the boy and two other members of the family died of typhoid fever within a short time. The doctor positively states that during his illness the boy never complained nor showed anything abnormal about the ear.

**CASE 44.—Chronic Purulent Inflammation of both Middle Ears, Involving Both Mastoids; Spontaneous Perforation on Left Side; Operation; Subsequent Abscess on Right Side Two Years after Mastoid Operation; Complete Recovery in about Two and a Half Years.**

Willie S—, male, five years old (this case figures as No. 28, Article III., these ARCHIVES, vol. xviii., No. 2, 1889), I found lying on the operating table in my office September 22, 1888, at 8:30 A.M., being cared for by his mother. He was unconscious, kept his eyes closed, and only reacted by screaming when touched about the head. He was very pale, emaciated, the skin very warm and dry. The temperature was not taken. The mother gave the following history: On the 24th of August the child came running into the house complaining that a boy threw a rock which struck him on the ear. This, however, was not the case; it was merely a way of expressing that he had pain in the ear. The two following days he went out to play, but towards evening he became very restless and he could not sleep at night. He was then confined to the house, would still play, but would suddenly complain of pain in the temple and lie down of his own accord. Every day he had some fever, and the discharge in the right ear almost ceased entirely. His general condition rapidly grew worse; he refused food, and lost flesh rapidly. September 7th the right ear began to discharge very freely, and he then rested better at night. About this time the mother noticed a swelling on the right mastoid region, which became larger every day to the present condition. Almost unconscious, he was wrapped in blankets laid on pillows to be taken here. They travelled several days, first forty miles in

a stage, then on a small steamboat, and at last with the train. During the journey the boy was expected to die at any moment, and was even given up by several physicians who saw him on the road.

I found a large abscess on the right mastoid region. I gave him a little ether and opened the abscess by a free incision, emptying about three tablespoonfuls of thick decomposed pus. I then syringed with carbolyzed water, which ran freely out of the meatus, applied a rubber drain and an antiseptic dressing. Being alone and afraid of the child dying in my office, I could not do any more.

*September 23d.*—I called at the house and found the child dressed lying on the sofa; a wonderful improvement has already taken place; his complexion is clearer; he asks for food, and slept well all night. I removed the dressing, syringed with a two-percent. solution of carbolic acid, and dressed as usual. This was continued daily until September 29th, when the communication which until now had been very free, stopped entirely. The wound in the mastoid has closed to the size of the drain, but the neck, as well as the occipital region, began to swell. The boy having gained sufficient strength, I sent him to the German Hospital for operation.

*Operation:* Dr. Morse assisting. Ether narcosis. A small polypus of the middle ear was first removed with the cold snare. The swelling on occipital region and neck very much increased. The side of the head was first shaved and thoroughly disinfected. The fistulous opening in the mastoid was enlarged upward and downward to a length of 4 to 5 *cm.* The soft integuments very much infiltrated, 2 *cm* in thickness; between it and the bone an irregular layer of fungous granulations. The surface of the bone was rough, and in the same a fine fistulous opening existed 3 *cm* from the posterior wall of the exterior meatus, and at the same height with it. The fistula was enlarged with gouge and mallet, the external plate being very thick and hard. The mastoid consisted of several medium-sized cells filled with pus, and divided by very thick and firm trabeculæ. In the deeper portions a very thick layer of bone was found dividing the mastoid into two cavities, one backwards and one more forward in the direction of the antrum. No direct communication was detected between the two, and the partition had to be removed with the gouge and mallet very carefully to a depth of 2 *cm.* In syringing imperfect



communication existed. The mastoid was packed with iodoform gauze and dressed as usual. At 3:30 P.M. I found him sitting in bed playing, he did not know he had been operated, and complained about the doctor who put something to his nose. From now on he improved rapidly, was treated daily, and left the hospital on the 15th to be attended in my office as out-door patient. The communication soon became very free again.

*October 15th.*—The external wound was granulating so rapidly that a conical lead nail 2 cm in length had to be inserted. The swelling has disappeared completely.

*October 22d.*—The right ear has been treated daily in same manner. The left ear, which still discharges fetid greenish pus, has been syringed the last few days with creolin. A two-per-cent. solution produced considerable pain, the child crying long after he left the office; a one-per-cent. solution was then taken, having about the same effect, while the discharge neither decreased nor changed its character.

*November 16th.*—The nail was reduced in length, communication having ceased.

*November 29th.*—I again applied a longer nail, but it produced pain, and a few hours later it had to be replaced by one  $1\frac{1}{2}$  cm long.

*December 25th.*—No signs of granulations in the mastoid proper; the bone is still denuded as far as the probe reaches. It was therefore scooped out to-day with a sharp scoop. The discharge has gradually decreased; it is now very slight and has no offensive odor.

*January 5, 1889.*—Scooped out the mastoid again, removing some necrotic scales of bone. Leaving for Europe he was now left in charge of my assistant, Dr. E. S. Clark.

*January 19th.*—About in same condition. Leaves for his home to stay several weeks, the mother being well instructed as to the care needed.

*February 15th.*—Called again for treatment. The right ear shows no discharge, and free communication still exists. He was attended daily to March 4th.

*April 4th.*—He came again and was treated two weeks.

*July 18th.*—He was found in same condition and was treated daily until the 23d. On the 25th he was brought in, having a large abscess over the left mastoid region, which was opened, and fully two ounces of matter eliminated. He was syringed with car-



bolized water, a few strips of iodoform gauze were introduced in the cavity, and bandaged. Patient leaves to-day for Australia, and was therefore left to the mother's care. The right side still had a nail.

*January 29, 1890.*—The child was brought in again. The mother states that for two weeks after leaving here she poulticed the left side, which gradually healed up. On the right side the nail was still worn two months, and then left out because it could not be kept in place. The wound on this side also rapidly healed.

*Status Præsens:* Bilateral. External meatus normal, memb. tympani propria destroyed, memb. flaccida present, the handle of malleus shortened and adherent to the promontory. The mucous membrane of the middle ear covered with epidermis. Some depression on mastoid, with a linear scar; no pain upon pressure. In probing with a cotton-holder the cotton is slightly moistened, but there is no smell.

Practically the child is cured. The hearing could not be measured with accuracy, but he hears conversation better, and speaks now plainly enough to be understood by everybody, while before the mother was the only one who could guess what he said.

*(To be Concluded.)*

A CASE OF ORBITAL CELLULITIS AND PRIMARY  
MASTOIDITIS INTERNA COMPLICATING INFLU-  
ENZA; OPENING OF MASTOID PROCESS; RE-  
COVERY.

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IN the following I beg leave to communicate an ocular and an aural complication of influenza, which, even if by too great a skepticism their connection with the latter should be doubted, are sufficiently interesting in themselves on account of their rather rare occurrence.

*History:* The patient, a girl of ten years, moderately well nourished, had as an infant blennorrhœa neonatorum. In December, 1888, I saw her first on account of adenoid vegetations in her naso-pharynx, which I removed with Gottstein's knife, and subsequent cauterizations with chromic acid, according to Hering's 'method, with lasting good result. On March 28, 1891, I was called in consultation with Dr. L. Reinhard to see her at her residence for an inflammation of her left eye. Her family physician stated that she fell sick two days previously with the symptoms of influenza, especially severe headache and general nervous prostration.

*Status Præsens:* She is lying in bed. The left upper lid, in a state of ptosis, is hanging over the eye and cannot be raised to its normal position. It is slightly red and swollen. The palpebral conjunctiva shows only an inconsiderable increase of redness, no swelling, looks as if affected with a commencing catarrhal inflammation, and is partly covered with some threads of mucous discharge, which however is very scanty. The ocular conjunctiva is not chemotic, only somewhat hyperæmic. Cornea clear.

Pupil reacting to light perfectly well and equally with that of the other eye. But there is a moderate exophthalmus with displacement of the left eye downwards and towards the temple. The movements of the eye are impaired, especially inwards and upwards. When looking upwards and inwards, crossed diplopia sets in. Tension the same as in the healthy eye. Pressure on the globe is painful, but the finger cannot feel any hardness between the walls of the orbit and the bulbus. Especially at the upper temporal region no circumscribed swelling, so that an affection of the lachrymal gland can be excluded. V and field of V normal. The ophthalmoscopic examination reveals a normal disc, but a marked tortuosity of the retinal veins, which might have been taken for a sign of retinal congestion, had not the other eye exhibited the same appearance, which, as it has not changed until now—at the same time causing not the least functional trouble,—seems to be an individual peculiarity of vascular arrangement. The tongue is thickly coated and has a strawberry-like aspect, as seen in scarlet fever. Both tonsils are very much swollen and painful, but are not covered with pseudo-membranes. The skin of the whole body shows an erythema of a scarlatinous redness. No œdema. No albuminuria. The fever, which at first has been very high, is now moderate. I made the diagnosis *incipient orbital cellulitis*, and ordered iced applications, to be applied day and night. The next morning I found about the same condition. Under this rigorous antiphlogosis, which was carried out most faithfully, the inflammation gradually subsided, so that, when I was called again on April 3d, the swelling of the upper lid was diminished and the child could partly open her eye. There was hardly any discharge. Exophthalmus and displacement downwards and towards the temple, divergent strabismus in looking to the right, and difficulty and limitation in movement upwards and inwards, and diplopia persisted. The swelling of tonsils had decreased also. But another ailment had set in, a violent pain in left mastoid process, which was increased by the touch with the finger. The external meatus plugged by epidermic scales, so that *Mt* could not be seen. Ord. ice-bag on mastoid process, instillation of natr. carbon. into the meatus, and calomel internally.

*April 4th.*—Some of the impacted epidermis removed by syringing. Walls of the external meatus swollen, preventing a view at the *Mt*. The child could stand the ice-bag very well, which

relieved her greatly. The sensitiveness of the mastoid considerably diminished. She slept well. No headache.

*April 5th.*—The patient feels very much better. Mastoid process hardly painful any more upon pressure. Epidermic plates in meatus still, but no pus. Eye affection the same, though less in degree. Tonsils still swollen, the left side of the soft palate cannot be raised so well as the right side (Loewenstein<sup>11</sup> observed the same). Iced applications on eye and ice-bag on mastoid continued, and calomel. I did not visit the child any more until April 16th, since the pain had disappeared, and she felt so well that she could leave the bed. On April 16th I was sent for again, the pain in left mastoid process having begun anew the night before last. The day before she felt better, was out of bed, and played. But last night the pain became exceedingly severe, radiating over the neck, head, and left shoulder. Pressure on the mastoid is very painful. The walls of meatus swollen, but not red. *Mt* cannot be seen on account of the swelling and some remaining epidermic scales, which resisted all efforts of removing, the child being very nervous. But the auditory canal is perfectly dry, does not contain the least discharge. Exophthalmus gone, but still slight ptosis and crossed double images, when looking to the right and upwards. Pupils acting normally. Fundus, especially optic disc in both eyes normal, the retinal veins exhibiting the above-mentioned tortuosity. *V* not affected. Temperature slightly raised. Pulse rapid and small. Child is put to bed. Mastoid and neck brushed with tinct. iod., and ice-bag applied to mastoid. Internally calomel 0.30 dos. iii. Temperature at 5 P.M., 38.4° C.; at 8 P.M., 38.4° C.; *April 17th*, Temp. at 6 A.M., 36.10° C. She slept pretty well, but could not stand any more the pressure of the ice-bag. I ordered warm-water dressings and tinct. iodi applied twice a day. The integuments of mastoid presented not the least swelling or redness, so that there was no sign of a commencing periostitis externa. But the severe localized *pain*, the *fever*, and the *sickly appearance* of the patient, who looked rather pale, led me to believe, that there was an *acute mastoiditis interna* going on, and that the inflammation of the lining membrane of the mastoid cells might have turned into suppuration already, or at least was threatening to do so. Therefore I prepared the parents for an eventual opening of the mastoid process on the next day. Temp. at 8 P.M., 38° C. (in axilla).

*April 18th.*—The condition of the patient being the same as yesterday (temp.  $38^{\circ}$  at 6 A.M.), I thought it unsafe to wait any longer with the operation, for which I had everything ready. In chloroform-narcosis and under strictest aseptic and antiseptic precautions I made a large incision down to the bone. No ligatures were required. The periosteum and the external surface of the bone were healthy. The bone was opened with chisel and mallet. Corticalis pretty thick. When the antrum was reached the bone was chiselled off in such an extension, that an opening of a little more than 1 cm in diameter was obtained. The mastoid cells were found to be completely filled with red spongy fungoid granulation tissue, which was scraped off with Volkmann's sharp spoon. After thorough scraping and irrigation with sublimate solution 1 : 2000 a tampon of iodoform gauze with plenty of iodoform powder was introduced into the cavity and tightly packed. The external wound was not stitched. The meatus was also filled with iodoform gauze, and then a thick layer of iodoform gauze and carbolated absorbent cotton was fastened by sterilized bandages, encircling the head only, leaving the lower jaw free. The operation was performed at 8 A.M. Temperature at 6 P.M. normal. No pain. The child feels easy, sitting up in bed. The pain never returned after the operation, and the highest temperature was  $37.5^{\circ}$  C. The first change of dressing was made April 27th, on the 9th day after the operation. There was very little secretion in the iodoform gauze. No pain at all in the wound. Walls of the external meatus still swollen but not painful, and no discharge in its gauze. The swelling was gone at the next change of dressing, a week later. The dressing was renewed once a week until July 6th, when the very small tampon was left off. July 17th the wound was perfectly healed, exhibiting a depressed funnel-shaped scar. Hearing normal. *Mt* of normal appearance. Since the operation the child's general condition had improved wonderfully.

When I first saw the patient I had the impression that her disease was scarlet fever. The scarlatinous exanthema, the severe angina tonsillaris, the strawberry tongue, and the fever formed the well-known aspect of this disease. But the sudden attack of the previously healthy child, the rapid development of these symptoms with nervous prostration, and the subsidence of the exanthema after two

days, without desquamation later on, corroborated in my mind the diagnosis of the well-experienced family physician who had seen the sickness from the first day. *Exanthemata* in influenza, especially scarlatinous erythema, are described by a number of observers. Fraentzel<sup>2</sup> relates two cases of influenza in two children, which he at first took for scarlet fever, on account of the erythema, but found this diagnosis erroneous from the short duration of the redness and the absence of subsequent desquamation. Leyden,<sup>3</sup> Ewald,<sup>4</sup> P. Guttman,<sup>5</sup> Renvers,<sup>6</sup> Riess,<sup>7</sup> Schwimmer,<sup>8</sup> Duflocq,<sup>9</sup> report similar cases, and Antonin<sup>10</sup> distinguishes a special form of influenza, which commences with an exanthema. *Pharyngitis* and *angina tonsillaris* are considered also as very often associated with influenza by Leyden, Renvers, Fraenkel,<sup>11</sup> Glower.<sup>12</sup> Loewenstein<sup>13</sup> observed it in all his 78 cases of influenza from the very commencement. Since, from these considerations, there could be no doubt any more that we had a case of influenza, the next question arose, whether the affection of the left eye was in connection with the general disease. There being no local cause for the *orbital cellulitis*, I thought it to be of metastatic nature, induced by the general infection. It seemed to be analogous to orbital cellulitis or orbital phlegmon observed in other infectious diseases, as in glanders, anthrax, typhoid fever, variola, and scarlatina (Berlin,<sup>14</sup> Schweigger<sup>15</sup>). In the last two years several observations of similar eye affections due to influenza have been published, wavering, however, between the diagnosis *orbital cellulitis* and *tenonitis*, so that it seems to me worth while to give this question some attention. *Tenonitis* was first described by O'Ferrall<sup>16</sup> under the name "*inflammatio tunicae vaginalis oculi*," not based, however, on anatomical researches. He laid the chief stress on one symptom, the limitation of the inflammatory oedema to the tarsal portion of the upper lid. Berlin<sup>17</sup> contends the pathognomonic value of this symptom, and is of opinion that the affection of Tenon's capsule is only a complication in some forms of phlegmon of the retrobulbar tissue, being only a portion of the latter. Schweigger<sup>18</sup> thinks it to be very unlikely that an inflam-



matory process of well-marked symptoms should be confined exclusively to Tenon's capsule, without involving the orbital tissue. Linhart<sup>19</sup> considers tenonitis only as a "supposed possibility." In opposition to that Mooren<sup>20</sup> characterizes tenonitis by the following symptoms: impaired mobility of the globe with slight protrusion of the eye and transparent chemosis. Hock<sup>21</sup> describes a case of genuine tenonitis, based upon redness and chemosis of the ocular conjunctiva, lack of mobility in all directions, tearing pain, especially in movements, but the eye not protruded. He considers the latter symptom as the most important in retrobulbar cellulitis. The clinical features of *orbital cellulitis* are: dull pain in forehead or orbit, inflammatory swelling of lids, especially the upper lid, swelling of the ocular conjunctiva, deficiency of mobility, either general or partial, exophthalmus, and diplopia. The lack of mobility and exophthalmus are caused either mechanically by the inflammatory effusion acting as a displacing foreign body, or by paralyzing the nerves and muscles through pressure. By some authors inflammatory and degenerative changes in the ocular muscles were observed (Schmidt-Rimpler,<sup>22</sup> Leyden,<sup>23</sup> myopathia propagata, Friedberg<sup>24</sup>). The superior rectus and the levator palpebræ superioris seem to show a predilection for the affection (according to Pagenstecher<sup>25</sup>), causing ptosis and preventing rotation upwards. In the milder forms of orbital cellulitis authors concur in the *absence* of chemosis. If we consider now the recent observations of tenonitis and orbital cellulitis in consequence of influenza, so far as I have perused the incident literature, they come under the following headings: *Purulent Tenonitis*: one case of Fuchs<sup>26</sup> and one of Schapringer.<sup>27</sup> *Serous Tenonitis*: three cases of Fuchs and one of Greef.<sup>28</sup> *Orbital Cellulitis*: two cases of Pflüger,<sup>29</sup> one of Stoewer,<sup>30</sup> one of Valude,<sup>31</sup> *with orbital abscess*: one case of Borthen,<sup>32</sup> and one of Socor.<sup>33</sup> Fuchs as well as Greef, in their cases of serous tenonitis suspected at first incipient phlegmon of the orbital tissue, but corrected this assumption into the diagnosis tenonitis on account of the three following points: 1. The intense œdema of the conjunctiva (chemosis); 2.

The unusual limitation of mobility of the globe; 3. The moderate exophthalmus. Pflüger, however, thinks that the three cases of Fuchs, as well as his own two, are to be taken for cases of inflammatory œdema of the orbital structures, since in all the globe was displaced only in one direction, namely, forward and downward. He apparently thinks, and Stoewer and Borthen are of the same opinion, that in tenonitis the displacement is only forward, and the lack of mobility is general, not partial. He further says that the inflammatory œdema of the lids is a sign of orbital cellulitis, whereas Stoewer claims the absence of this phenomenon as confirming his diagnosis of retrobulbar effusion behind Tenon's capsule, excluding tenonitis. If we remember the anatomical relations of Tenon's capsule to the eyeball, nothing seems to be more natural but that one of the first symptoms of tenonitis, *i. e.*, an effusion between its parietal and visceral portions, must be chemosis of the ocular conjunctiva. The resistance there is much less—being only the loose, pliable, and easily movable conjunctiva—than at the posterior segment of the globe, where the whole eyeball would have to be pushed forward. The equal restraint of mobility in all directions, and the pain experienced in movement, are easily understood from the fact that all the ocular muscles are ensheathed by Tenon's capsule, and must naturally suffer from accumulations of inflammatory products in the capsule. In those cases described as tenonitis, in which the exophthalmus was more conspicuous, it seems to me more natural to assume a simultaneous inflammation of the retrobulbar tissue, which cannot expand except by protruding the eyeball, and therefore explaining, if circumscribed, the displacement not in the direction of the orbital axis, but forward and downward. In our case, however, as well as in those of Pflüger and Stoewer, the orbital cellulitis was not universal, but only confined to the upper portion of the orbit, affecting the upper branch of the oculomotor nerve by compression, and thus creating paresis of the levator and superior rectus, and the branch supplying the internal rectus. It was very mild, not implicating Tenon's capsule,

and therefore not producing chemosis, so that Tenon's capsule acted, as it were, as a barrier, preventing the effusion in the orbital tissue from finding its way into the capsule itself, and then beneath the ocular conjunctiva. It is not even necessary to assume an effusion; it might have been simply a hyperæmic condition of the retrobulbar tissues, as observed in other organs, being one of the characteristic effects of influenza.

The ear is the organ which has shown particularly well the tendency of influenza to lead to hyperæmia. Michael<sup>34</sup> has formulated the character of ear diseases in influenza in the following résumé: "The ear symptoms in influenza are objectively and subjectively the expression of an intense hyperæmia of the mucous membrane of the hearing organ." "Middle ear and mastoid process are enormously painful, because the swollen mucous membrane suffers from pressure. The products of inflammation, however, are absent, and with these the usual doughy swelling." "The hyperæmia is the indirect cause of the observed complications, leading to ruptures of blood-vessels, whose walls may be altered, and consequently to hemorrhages, and rendering the mucous membranes more susceptible for the invasion of infectious matter." Mostly all observers described as the most common ear complication in influenza, otitis media of great intensity and great pain, with tendency to hemorrhages. According to Schwabach,<sup>35</sup> the external ear participated more frequently than usual with intense inflammatory infiltration of the walls of meatus and extensive scaling of epidermis. Szenes<sup>36</sup> observed several times eczema of external meatus. In regard to affections of the mastoid, the observers are divided. Stimmel<sup>37</sup> never had to open the mastoid in his 100 cases of otitis media. Dreyfuss<sup>38</sup> found seldom the tendency to mastoiditis. Hoffmann<sup>39</sup> never observed it in 35 cases; Eitelberg<sup>40</sup> 1; Schwabach<sup>41</sup> 2 in 100 cases of otitis media, of which only one was opened. On the other hand, Politzer,<sup>42</sup> Gruber,<sup>43</sup> Ménière,<sup>44</sup> Szenes,<sup>45</sup> Chatelier,<sup>46</sup> noticed frequently the implication of the mastoid. Ludewig<sup>47</sup> saw repeatedly acute caries. Of Jansen's<sup>48</sup> 100 cases, the mastoid was affected in

57, in 25 chiselling, in 12 subdural abscess, with 2 deaths. Moeser<sup>40</sup> describes a case of *primary periostitis* of the mastoid due to influenza. In all these cases the mastoiditis was *secondary* to otitis media. Our case, however, is a case of *acute primary mastoiditis interna*. The accumulation of epidermic scales had nothing to do with the inflammation, and the swelling of the walls of the meatus was only a secondary affection to the inflammation of the mastoid. There was never any discharge from the ear, and from the very beginning the pain was confined to the mastoid spontaneously, and on pressure, without redness or swelling of the integuments. *Primary mastoiditis interna*, i. e., the primary inflammation of the lining membrane of the mastoid cells, without manifestations on the external surface of the bone or the periosteum, and without preceding otitis media, is a very rare disease (Schwartz, <sup>80</sup> Politzer, <sup>81</sup> Fulton, <sup>82</sup>). According to Politzer, it is due to the effects of colds, injury or syphilis. The chief symptom, on which the diagnosis rests, is the constant and *persistent pain* in the mastoid, radiating over the head, face, neck and shoulder, as very precisely described by Knapp.<sup>83</sup> If left to itself, there will be a very late appearance of inflammatory symptoms, as swelling and redness in the external parts. In our case the *pain* was very characteristic with *absence* of *external symptoms*, the *fever* and the influence on the *general condition* of the patient supporting the diagnosis very effectively. The intermission of pain of about ten days may be explained by the abatement of the hyperæmia (under the very rigorous antiphlogosis), which, from the violent symptoms from the very beginning, must have set in very rapidly and very intensely. It returned when the inflammatory products, the fungoid vegetations of the degenerated mucous membrane had developed to such a degree that they filled the mastoid cells, obstructing the access to the tympanic cavity, and thus preventing a secondary inflammation of the latter. Or it may be interpreted by a re-invasion of the pathogenic poison of influenza, as some observers commented upon the relapses during the course of influenza. In otitis media due to influenza, the following micro-organisms have been found:

diplococcus pneumoniae (Fränkel-Weichselbaum), streptococcus pyogenes, staphylococcus pyogenes albus and strept. pyog. alb. (Zaufal,<sup>54</sup> Finkler,<sup>55</sup> Scheibe,<sup>56</sup> Gradenigo<sup>57</sup>). Fuchs found the diplococcus pneumoniae in purulent tenonitis, Socor diplo-, strepto-, staphylo-cocci in phlegmon of the retrobulbar tissue. This leads us to the question, whether the ear complications in influenza are a propagation of the inflammation of the pharynx and tonsils, or whether they are a localization of the influenza itself in the ear. In our case the latter seems to be the most probable, inasmuch as a transportation of the phlogogenic matter from the pharynx would have followed the anatomical paths and first affected the tympanic cavity instead of leaving it intact, invading only the mastoid cells. Besides that, the character of the hyperæmic condition, as found at the operation, would be in favor of a direct localization.

In regard to the treatment leeches (Michael, *l. c.*) are most recommended as best adapted to relieve such hyperæmic affections. The general condition of our patient, however, did not admit of such weakening measures, especially as in case of failure opening of the mastoid would have been resorted to. The affliction being an acute one, the pain alone would not have been a sufficient indication, as, according to Knapp (*l. c.*, p. 368), "the vast majority of cases of acute mastoiditis get well without an operation, when rest in bed and rigorous hygienic deportment are enforced." "Yet when the symptoms are alarming, and when in spite of strict treatment the headache does not abate, I think the opening of the mastoid indicated." Schwartze (*l. c.*) proposes the operation, if after eight days the antiphlogosis has not produced a decided improvement. In our case, the revival of the symptoms after an intermission of ten days, especially the fever and the impoverished condition of the child were sufficient proof that a further delay of the operation would have been deleterious to the patient. The possibility was that, our waiting for the development of empyema of the mastoid with more striking symptoms, might have exposed the patient to the dangers of pyæmia or meningitis, or to a secondary purulent otitis



media with perforation of *Mt*, and lingering course or, what in our case was not very likely, that by passing into a chronic mastoiditis interna it might have led to sclerosis of mastoid (as observed by Knapp, *l. c.*), causing great suffering to the patient, and necessitating, perhaps, a later operation under much more unfavorable circumstances. The condition of the mastoid cells found at the operation and the result proved, that in this case the operation was the only right proceeding. Our case, therefore, is a new addition to the series of those aurists who, under similar conditions, advocate an *early* operation. In regard to the technique of the operation and the treatment in this as in other cases, the strictest aseptic and antiseptic measures, with iodoform-gauze tamponade as drainage (no tubes, no plug of lead), have given excellent results.

To sum up, we have a case of influenza—its diagnosis based upon the sudden onset of symptoms with nervous prostration, exanthema, angina tonsillaris, pharyngitis—with orbital cellulitis and acute primary mastoiditis interna as a result of the tendency of influenza to cause hyperæmic, and further on inflammatory, conditions in different organs.

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## SYMMETRICAL CONGENITAL DEFECTS IN THE ANTERIOR PILLARS OF THE FAUCES.

BY MAX TOEPLITZ, NEW YORK.

(*With one wood-cut.*)

ON account of the scarcity of attractions of symmetrical congenital defects in the arcus palato-glossi, I feel justified in reporting such a case, together with an illustration.<sup>1</sup> It came under my observation in my service at the Ear and Throat Department of the New York Ophthalmic and Aural Institute.

W. D., æt. twenty-three, parents living and healthy ; mother suffers from periodical attacks of asthma ; youngest sister, æt. twenty-one, consumptive. Our patient had measles when two years old, scarlatina and "pharyngeal croup" (Rachenbräune) when five, from which he suffered for an entire year ; at the same time bilateral otitis media and "cellulitis" on either side of the chest, which, when punctured, had discharged pus, subsequently also on irrigations. The cellulitis was of one month's duration. He had peritonitis when twelve years old.

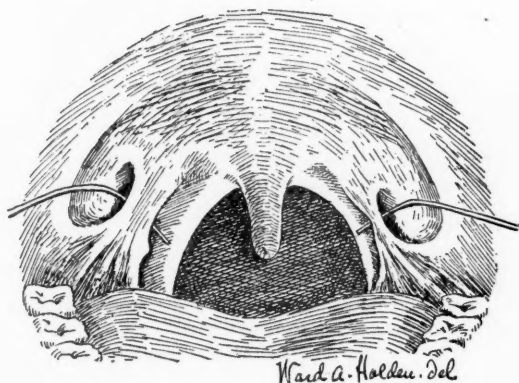
The patient remembers the openings in his mouth back to an early date, and has been told of their very early existence by his parents ; his attention, however, has not been directed to it prior to the "diphtheria." He still suffers from continuous otorrhœa, and has been operated for nasal polypi and hypertrophy of the pharyngeal tonsil when fifteen years of age.

The examination reveals two symmetrical openings in the palato-glossal arches, the right one being slightly larger and somewhat more remote from the margin of the anterior pillar. Their margins are

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<sup>1</sup> Dr. Ward A. Holden kindly made the excellent drawing, for which I am exceedingly indebted to him.

smooth without a trace of cicatrization. They are about  $\frac{1}{8}$ " long,  $\frac{3}{16}$ " wide, of elliptical shape, and end medially, as the probe indicates in the illustration, freely into the oral cavity, posteriorly blindly into the space, where the oral tonsils are usually located, the tonsils themselves being entirely absent. Below the right opening, more marked than below the left one,  $\frac{1}{4}$ " from its margin there is a slight indication of what might be considered a radiated scar, but what resembles more radiated folds.



Small nasal polypi in the right nostril and a considerable perforation of the right membrana tympani complete the examination.

The literature contains not more than six similar observations, made by Wolters,<sup>1</sup> J. Solis Cohen,<sup>2</sup> Lefferts,<sup>3</sup> O. Chiari,<sup>4</sup> and Schapringer.<sup>5</sup> J. H. Claiborne<sup>6</sup> describes a hiatus in the anterior pillar of the right side only, whilst the defects of all the other observers are bilateral. Schapringer also mentions a one-sided defect in his paper, and I remember having observed one also some time ago.

<sup>1</sup> Wolters, Henle u. Pfeuffer's *Zeitschr. f. rat. Medic.*, dritte Reihe, Bd. vii., p. 156, 1859.

<sup>2</sup> J. Solis Cohen, *Medical Record*, July 20, 1878, p. 45; and "Diseases of the Throat," second edition, p. 206.

<sup>3</sup> Lefferts, *Phila. Med. News*, January 7, 1882.

Another case, which was presented to Lefferts' class at the Coll. Phys. and Surgeons, N. Y., April 18, 1890, has been kindly communicated to me by the author, together with a third unpublished case with two round openings.

<sup>4</sup> O. Chiari, *Monatschr. f. Ohrenheilk.*, etc., Jahrg. xviii., No. 8, August, 1884, p. 140.

<sup>5</sup> A. Schapringer, *Monatschr. f. Ohrenheilk.*, etc., 1884, No. 11.

<sup>6</sup> J. H. Claiborne, *Amer. Jour. Med. Sci.*, April, 1885, p. 495.

Schapringer's, as well as my patient, had undergone a severe attack of diphtheria in early childhood. Chiari's patient had suffered from sore-throat, whilst Claiborne's and Lefferts' cases had "never ulcerated sore-throat, never inconvenience." J. Solis Cohen does not mention any previous inflammatory condition in the history of his case.

Schapringer records a rudiment of the left and the absence of the right tonsil. Claiborne emphasizes the entire absence of either tonsil, and there is no trace of them in my patient.

At the Oct. meeting of the "German Physicians," held October 23, 1891, at Dr. A. Jacobi's house, where I presented this case for general discussion, no explanation for this condition could be offered. The opinion of all present concurred in its congenital nature, but whether it was due to arrested development (Chiari, Lefferts) or to separate investment of the muscle (J. Solis Cohen) could not be definitely settled.

In Schapringer's case a shallow furrow extended from either nostril to a short distance downward the upper lip without reaching the red mucous covering, the left being more marked than the right one, which he considers as indications of cleft palate, cured during intra-uterine life, an observation which confirms our opinion about the congenital character.

The location near the median line makes their connection with branchial fissures quite improbable. The bilateral occurrence of the openings favors the supposition of their congenital origin, whilst their appearance on one side only, and also the absence of the tonsils, which occurs frequently in adults, have no especial bearing upon their intra-uterine development.

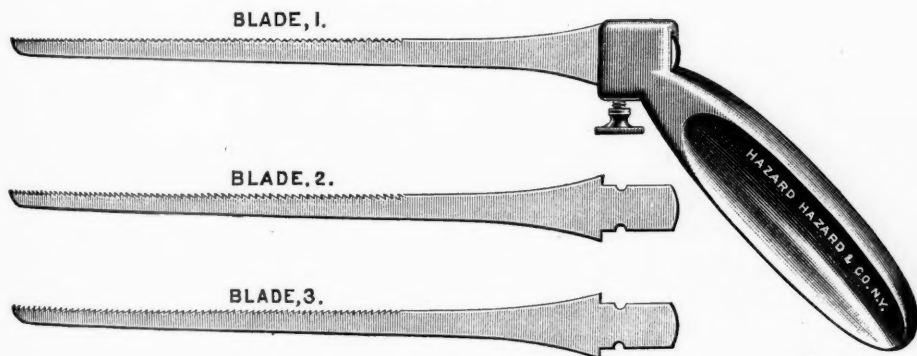
The knowledge of these defects is, at any rate, of practical import for the differential diagnosis of other affections.

## A UNIVERSAL NASAL SAW.

BY DR. CHAS. A. BUCKLIN.

IN the *Medical Record* of October 24, 1891, Dr. Charles A. Bucklin, of New York, describes his universal nasal saw. In compliance with a suggestion of the author we publish the following abstract from his communication.

The handle is of sufficient size to give one a firm grasp, which is important when the bony deformity is large. Being of aluminium, it is aseptic and light, notwithstanding its size.



The instrument has three reversible blades, six inches long, containing three and one half inches of cutting teeth.

Each blade is designed to overcome special difficulties. They are not hampered by probe-points, and may be rapidly withdrawn and re-entered through the cuts they make when hemorrhage or a change of saw makes it desirable.

Blade No. 1, or the Bosworth saw, consists of perfectly cone-shaped teeth, thirty to the inch. It is made thin, and

binding is avoided by dividing the cutting power equally between both sides of the teeth.

Conditions are encountered where it is desirable to cut only as the saw advances. Blade No. 2 will meet these conditions. This blade would bind were it not for the fact that the teeth are thirty-two to the inch. They rake sufficiently forward to enable the finger to determine the "rake," as the teeth are drawn over it, while on the return stroke the release is complete.

This blade is very satisfactory for the following reasons :

1. With the head firmly placed against a head-rest, the most natural way to cut with a saw is toward the support.
2. In attempting to remove the inferior turbinated bone entire, the spring of its posterior end frequently causes other saws to bend sufficiently to defeat the operation, which difficulty is not experienced with Blade No. 2.
3. Deformities of the septum which terminate at their posterior end in a delicate ridge will readily catch on teeth which cut on the return, thus springing the septum toward the saw. When this accident occurs a single stroke may cut directly through the septum. These dangers are also obviated by Blade No. 2.

Exceptional conditions may arise where it is desirable to use a saw-blade which cuts on the return stroke.

Blade No. 3. This blade is less frequently useful than either of the others. It can only be used on the turbinated bones in rare cases where Blade No. 2, from some accidental peculiarity in the formation of the bone, cannot be used.



## Reviews.

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**Handbook of Diseases of the Ear, for the Use of Students and Practitioners.** By URBAN PRITCHARD, M.D., F.R.C.S., Prof. Aural Surgery, King's College, London. Second edition, with illustrations. London : H. K. Lewis, 1891.

We have perused with a keen interest this treatise of 238 small-octavo pages and gained the impression that it ranks among the first in the long list of small text-books on the ear. It is unexcelled in clearness and conciseness. The anatomical part, with its numerous and well designed wood-engravings, is masterly, as could be expected from the author's well-known original researches in the human and comparative anatomy of the hearing apparatus.

The chapter on the functions of the ear is short. The modes of examination and the description of the various kinds of aural disease in the following chapters are as clear a guide in the recognition and treatment of this group of affections as any practitioner could desire. The diseases of the nose and pharynx, so important in the management of aural disease, are fully treated of. The correct and easy style shows the hand of a master.

H. K.

**The Anatomical and Histological Dissection of the Human Ear, in the Normal and Diseased Condition.** By ADAM POLITZER, Prof. Otology in the Vienna University. Translated from the German by GEO. STONE. London : Baillière, Tindall, & Cox, 1892.

We have just received and warmly welcome the English version of this fundamental work of Politzer, which we reviewed and highly recommended when the German original appeared, about a year ago. If anything can stimulate and facilitate original research in this most difficult department, the normal and pathological

anatomy of the ear, it is this elaborate treatise ; illustrated by very numerous wood-engravings. Mr. G. Stone deserves great credit for having made accessible this much needed book to the English-speaking otologists.

H. K.

**Diseases of the Nasal Organs and Naso-Pharynx.** By WHITFIELD WARD, A.M., M.D. New York and London : G. P. Putnam's Sons, 1891.

This is a well written and nicely gotten up compendium of 165 small-octavo pages, with numerous cleanly executed engravings in the text. The subject is presented with clearness and precision, altogether from the practical standpoint. The book will be very useful to every one who wants to become familiar with this important, formerly greatly neglected, branch of medicine, and treat its diseases intelligently and effectively.

H. K.

**The Throat and Nose and their Diseases.** By LENNOX BROWNE, F.R.C.S. (Edin.) Third ed. London : Baillière, Tindall, & Cox. 1890.

The portion of this work which comes under our notice in this journal is that relating to the nasal passages and pharynx, and in the present edition these subjects have received an increased amount of attention at the hands of the author. In fact, he recognizes to the full the importance of a right understanding of these affections. In this work (setting aside the laryngeal portion) we have the following *seriatim* consideration of subjects. First, a sketch of the anatomy, followed by a description of the methods of examination and appearances seen. In separate chapters we then have a consideration of diseases of the pharynx, of the uvula, of the tonsils, diphtheria, lupus, diseases of the nose and naso-pharynx, and, lastly, two chapters devoted to aural maladies associated with naso-pharyngeal disease. In the paragraph on posterior rhinoscopy we are astonished to find no mention of palate-hooks ; an india-rubber band passed through the nose being the only means of drawing forward the palate referred to, as the author objects to "instrumental aids of complicated character." Needless to say to any one who has tried it, that a good palate-hook, such as White's, is of immense service. The figures of galvanic snares (p. 138) ; these instruments more clumsy, and thicker than there is any need for nowadays. The author's large experience of tonsillotomy leads him to say that very rarely is there a redevelopment of the hypertrophy, but as such a circumstance is not outside his experience, he always endeavors to remove as much of the gland as can be pressed into

the guillotine, and deprecates the removal of a "slice" only. In twenty years he has only known three cases in which bleeding has been serious, and only one in which it has been at all alarming. In view, however, of the possibility of accidents, he insists, when feasible, on the residence of out-patients, for a few days, in hospital, and of private patients within reach. Coming to nasal and naso-pharyngeal diseases, the author thinks that the importance of the pharyngeal bursa has been much exaggerated by Tornwaldt and Meers. There is an interesting and practical chapter on deviations and deformations of the septum. The author has given up treatment by cautery, incisions, and punches, and resorts to Curtis' trephines, and the nasal saw if necessary. He reports that he has obtained most gratifying results in over twenty cases from crushing dilatations with Hewetson's dilator. "The crushing of the turbinated bodies and bones and fracture of the outer wall, which must take place in some instances, appear to give rise to no troublesome symptoms." Septal displacement is also, it appears, sometimes an immediate result of forcible dilatation. This is to be straightened by the same instrument suitably modified by the author. Speaking of Woakes' necrosing ethmoiditis, the author mentions that in five years he has only seen two cases which could be described as caries of the ethmoid, which were not either syphilitic or malignant. He is therefore unable to confirm this author's observations. For the removal of nasal polypi he prefers the cold to the hot snare. On the subject of tapping the antrum the author says that failure to find pus as an *immediate* result of operation must not be too hastily accepted as evidence of erroneous diagnosis, as on more than one occasion a purulent discharge has been delayed for twelve or twenty-four hours after drilling. No reason for this is given. One of his patients cured himself of a chronic abscess in the antrum by inadvertently using a solution of chloride of zinc (40 grs. to the ounce). The chapters on the ear contain some elementary instructions on the examination and treatment of aural cases, with diagrams for clinical notes. A small pharmacopeia of formulæ completes the work. In regard to the illustrations, the colored plates at the end of the work (except possibly the one after Sappey of the lymphatics of the tongue, tonsils, etc.) are as in previous editions. The one illustrating the normal posterior rhinoscopic image is not very good, either as regards color or the delineation of the Eustachian orifices; and the wood-cut of the same image (p. 85) is also rough and imperfect. On the whole, the nasal and pharyngeal portion of this

work contains a great deal that is interesting, and, although we cannot agree with all the author's statements, we feel that he expresses his opinion candidly on the points raised, and by this means prevents the book from being a mere compilation, as is the case with so many text-books of the day.

**A Treatise on the Diseases of the Nose and its Accessory Cavities.** By GREVILLE MACDONALD, M.D. (London.) London : Alexander P. Watt, 1890.

This text-book forms a volume of some 360 pages, containing 60 illustrations, chiefly of instruments, but a few of histological character.

The first chapter details the author's experiments on the respiratory functions of the nose made on the lines of Aschenbrandt and of Bloch. The structure of the inferior turbinated body is next considered. In this connection the author says he has failed to find muscular fibres in the trabeculæ of the turbinated bodies. Neither can he be sure of anything corresponding to the tunica albuginea of the corpora cavernosa. He contradicts Sajous' statement that the capillaries open directly into the venous sinuses. The hypertrophies and œdemas so commonly met with in the nose are accounted for by the author by the diminished air tension, due to the obstruction to the free access of air to the respiratory passages. Chapter II deals with the methods of examination and the symptomatology. In a description of the nasal contents as seen from the front, the tubercle of the septum is not mentioned by name. The use of palate-hooks is discountenanced (pp. 30-35), they being rarely considered of service. It is true, the author allows (p. 76) that exceptionally a palate-hook may be of some assistance, but the figure given of White's instrument conveys an erroneous idea of the shape of its sliding attachment. Acute rhinitis (catarrhal, dry, and membranous) forms the subject of the next chapter. In chronic swelling of the erectile tissue, where he has failed with the galvanic cautery, the author has seen benefit from procedures with a small tenotome. In Chapter V. the author enters at length into the pathology of mucous polypi arriving at the conclusion that they are but an ordinary inflammatory production peculiarly modified by the conditions in which they exist. He describes "otitis granulosa" and "caries suppurativa" as occurring in the middle turbinated body. He insists on the obvious fact that "necrosing ethmoiditis" is always accompanied by

suppuration, in view of Woakes' statement that this disease is exceedingly common among patients who have none of the usual symptoms of diseased bone in the nose. Chapter VI. discusses the treatment and prognosis of these affections. Chapter VII. describes the practical aspect of mucous polypi, the use of the cold snare being advocated. We cannot agree with the author that Mackenzie's cog-wheel snare is the only possible instrument where it is necessary to hitch the noose over the polypus with the forefinger in the naso-pharynx. We have repeatedly operated in this manner with a more simple instrument. A long chapter (VIII.) is devoted to rhinitis sicca, and in it we find details of the author's method of treating ozæna, with which he claims to have effected great good. Details must be read in the original, but an essential fact is the physical method of augmenting the blood supply by artificially producing partial nasal obstruction. Chapters on affections of the accessory cavities and of the nasal septum follow. The remaining subjects treated at more or less length are nasal neuroses, post-nasal growths, tumors of the naso-pharynx, dyscrasiæ affecting the nose, epistaxis, etc. We are unable to follow the author in his explanation of asthma associated with nasal disease. For cauterizing the posterior wall of the naso-pharynx the author has invented a special guarded electrode, but when a palate-hook is used such an instrument is quite unnecessary. An appendix of thirty-three cases concludes the volume, some of considerable interest, *e. g.*, two of tubercular disease of the nose, one of fibrous tumor of the naso-pharynx and one of abscess of the sphenoidal sinus. A chromolithographic plate precedes the work, but the figure illustrative of what is seen by anterior rhinoscopy is imperfect, as it shows neither the tubercle of the septum nor the neck of the middle turbinated body. The views of the posterior nares in the other colored figures give a wrong impression of the Eustachian orifices, as with the mirror in the ordinary position the upper margin of the Eustachian cushion *appears*, owing to the necessary foreshortening, to be on a higher level than the upper margin of the choanæ. We have noticed a few misprints, such as "Zanfai," "Loschka," the statement that a piece of tubing measures ".008 m." in diameter, and the repeated use of the word "meati." Having thus drawn attention to some deficiencies we have noticed, we may say that the book is pleasantly and clearly written, gives evidence of considerable work, and contains many practical suggestions, the result of the author's own experience.

## SOCIETY MEETINGS, ETC.

EDINBURGH MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on July 8th, Dr. Galland read a paper upon "The Function of the Tonsils." Dr. Galland had come to the conclusion that these bodies have no absorbent function, but were rather to be looked upon as protective, arresting and destroying micro-organisms on their way to the lungs and stomach. The power which the tonsils apparently possess of reproducing leucocytes is probably secondary to the before-mentioned destroying function.

ONTARIO MEDICAL ASSOCIATION.—At the eleventh annual meeting, held on June 3d and 4th, at Toronto, Dr. Reeve, of Toronto read a paper upon "Points of General Interest in Otology."

CAMBRIDGE MEDICAL SOCIETY.—At the meeting on July 10, 1891, Mr. T. Hyde Hill related the particulars of two cases in which he had used hypodermic injections of pilocarpin for the relief of deafness. A certain amount of temporary improvement was noted, but the patients quickly returned to their former state.

LIVERPOOL MEDICAL INSTITUTION.—At the meeting on October 20, 1891, Mr. Rushton Parker related two cases in which otitis media was followed by pyæmia, and in one of which he adopted, with considerable success, the plan of tying the internal jugular vein and scraping out the lateral sinus.

PATHOLOGICAL SOCIETY OF LONDON.—At the meeting on October 20, 1891, Dr. Hector Mackenzie brought forward a specimen which illustrated the association of myxœdema with general tubercular disease of the viscera. The larynx and fauces were particularly affected both with œdematous infiltration and tubercular ulceration.

It has been proposed to amalgamate the "Société française d'Otologie et de Laryngologie" with "The Société de Laryn-



gologie, d'Otologie et de Rhinologie de Paris," and a committee, including the presidents of the two societies, M. Rualt and M. Gellé was appointed to consider the matter. This committee presented its report in favor of the fusion, but the exact terms of the amalgamation have not been finally determined.

NATIONAL EYE AND EAR INFIRMARY, DUBLIN.—By the report recently issued it appears that during the past year 404 patients have been admitted as in-patients, and 2,460 treated in the out-patient department. At present there are thirty beds in this institution, and the committee are anxious to increase the accommodation, for which purpose a sum of £7,000 is deemed necessary. For some time past negotiations have been going on with the authorities of St. Mark's Ophthalmic Hospital with a view to amalgamating the two charities, but hitherto no satisfactory arrangement has been made. This failure is much to be regretted.

BRADFORD EYE AND EAR HOSPITAL.—The annual report of this institution for 1890 is to hand, from which it appears that 490 ear cases have been under treatment. Some details of the cases are given, and it is recorded that the mastoid antrum has been opened five times by means of Schwartz's chisel.

#### APPOINTMENTS.

Russell Coombe, M.A., F.R.C.S., has been appointed surgeon to the West of England Institution for Deaf and Dumb Children, Exeter, vice Torswill.

James Kerr Love, M.D., has been appointed Aural Surgeon to the Royal Infirmary, Glasgow.

T. Lyle, M.D., has been appointed pathologist to the Newcastle-on-Tyne Throat and Ear Hospital.

#### BEQUESTS AND DONATIONS.

By the will of Mr. Henry Solomons, who died on May 12th, the Jewish Deaf and Dumb Home has received a legacy of £100. Mr. Solomons was one of the oldest members of Lloyds.

By his will the late Mr. T. Aitken, of Fallowfield, near Manchester, has left £100 to the Manchester Institution for Diseases of the Ear.

The Deaf and Dumb Institution of Manchester has likewise benefited to the extent of £500 under the will of the late Mrs.

Jane Rogers, of Woodfield, near Ross, who died on January 9, 1891.

Mr. Henry A. Brassey, late of Preston Hall, Aylesford, Kent, has bequeathed a sum of £500 to the Central London Throat and Ear Hospital.

The very remarkable will of a very remarkable man has recently been proved in Australia and in London. The late Dr. Beaney served with distinction in the Crimea, settled subsequently in Melbourne, and held in rapid succession all the most important and honorable of the professional posts in that city. For some time prior to his death he resided in London. During his stirring career he had acquired a very large fortune, of which the greater part is disposed of by will to the various charitable institutions in Melbourne, London, and elsewhere. Among the many charities thus benefited may be mentioned the Victoria Eye and Ear hospital.

The contributions to the Liverpool Hospital Fund were considerable, and enabled the committee to distribute upwards of £10,000, the Ear and Eye Infirmary obtaining an award of £406.

By the will of the late Miss Hannah Pickard, of Ossett in Yorkshire, the Doncaster Deaf and Dumb Institution and the Leeds Institution for the Blind, Deaf, and Dumb, receive legacies of £1,000, and they also participate in the residual estate.

Hospital Sunday collections in the Protestant churches of the county of Dublin were made on November 8th. The amounts obtained are not yet to hand, but it is satisfactory to note that of the total sum of £69,486 odd received since 1874, the National Eye and Ear Hospital has been awarded £1,548.

#### MISCELLANEOUS.

Among the numerous addresses and congratulations presented to the veteran Professor Helmholtz on the occasion of his recent birthday celebration, was one from the principal and professors of Glasgow University, numerous other corporate bodies, institutions, and individuals, presented addresses eulogizing Professor Helmholtz' scientific labors, and referring especially to his work on sensations of tone and other points connected with the auditory apparatus and functions.

As aural surgeon to the Glasgow Institution for the Deaf and Dumb, Dr. I. K. Love, in the seventeenth annual report of that establishment, supplies us with much valuable statistical infor-

mation concerning the condition of the inmates. He finds, for instance, that of 122 children in no less than 36, or upwards of 29 per cent., the deafness can be traced to active suppuration, the presence of accumulations, foreign bodies, etc. It is needless to point out to otologists the importance of such observations as these, and it is to be hoped that other deaf and dumb institutions will follow the example of the Glasgow Asylum in retaining the services of competent aural surgeons.

In the *Lancet* of October 3, 1891, Dr. I. Ward Cousins figures and describes a new instrument for the removal of foreign bodies from the meatus. The apparatus is in the form of a pencil-holder with a double snare of fine wire. In skilled hands this may occasionally prove useful, but none of these instruments can supersede the syringe.

A curious case has recently been tried at South Shields. By order of the Board of Trade, the Local Marine Board of South Shields have held an inquiry as to the competence of a sea-captain, and eventually the certificate of the individual in question was suspended until he should have recovered from the deafness from which he was suffering. This is, we believe, the first time on record when defective hearing has been officially held to militate against the proper performance of a seaman's duties, although otologists have long been urging the importance of paying some attention to the subject.

In a somewhat similar connection a letter appears in the recent Students' Number of the *Lancet* (Sept. 5th), in which the writer points out to parents and guardians that it is unwise to encourage those who are unfortunately afflicted with certain physical defects to enter upon the study and practice of medicine. In the somewhat formidable list of such defects, which the writer considers to be more particularly prejudicial, is included "deafness, with or without purulent discharge." It cannot be denied of course that such conditions seriously handicap their possessors in professional work, but, on the other hand, it must not be forgotten that the same physical defects are open to objection in any walk of life. It is possibly riding our hobby-horse a little too hard to insist upon the absolute exclusion of all such unfortunates from our ranks, and, on the contrary, many notable exceptions might readily be pointed out, in which much more than the average measure of success has accrued, in spite of the deformities, etc., in question.

## POST-GRADUATE COURSES.

LONDON.—The following lectures on otological subjects were delivered during the past session, viz. : On June 22d and 25th, "On Inflammation of the Middle Ear and its Complications," by Mr. W. Arbuthnot Lane. On June 25th, "On Mastoid Disease," by Mr. E. Woakes. On October 15th, "On the Examination of Ear Cases," by Mr. W. R. H. Stewart. On November 19th, on "Tinnitus Aurium," by Dr. Woakes.

The winter term commenced on October 12th and terminated on December 5th.

MANCHESTER.—Commencing on August 6th Dr. Milligan has been giving a series of six demonstrations at the Manchester Ear Institution.

EDINBURGH.—The lectures in connection with the post-graduate course in this city commenced on Monday, September 21st and continued until October 10th.

In a lecture on "Otorrhœa," delivered before the students of Charing Cross Hospital, and reported in the *Lancet* of July 25th, Mr. Marmaduke Sheild pointed out very clearly the dangers of permitting ear discharges to become chronic, and gave some practical hints as to the best methods of treatment.

